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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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EDITORIAL NOTES.

Institution Meeting—Sept. 21-24.

THE Council of the Institution of Gas Engineers have fixed the date for the postponed annual meeting. It will be from Tuesday, Sept. 21, to Friday, the 24th, which final day will be devoted to the excursion to Hastings—the home of the President, Mr. Chas. F. Botley, M.Inst.C.E. We believe the programme—general, technical, and social—as arranged for June will be carried through in its entirety, save for the formal delivery of the President's Address, which was published last week, and has already been circulated in pamphlet form among the members. There is now good hope that by September we shall be in normal state again in regard to coal supplies and traffic, although reaping the harvest of bad effects from the insane industrial upheaval through which we have been, and are still, passing.

The President's Address.

In last week's "JOURNAL," we published the Presidential Address of Mr. Charles F. Botley, M.Inst.C.E., to the members of the Institution of Gas Engineers. Undelivered on the day appointed, for reasons which we all deplore, it was appropriate that it should be at once circulated, inasmuch as, had it not been, in view of all that is happening at the present time, it might have devolved upon the President to recast portions of it before the holding of the meeting in September. However, had the address been delivered, the President would, we are sure, have had the gratification of hearing a complete endorsement of its contents from his professional compeers; for it marks current thoughts and actions in connection with the industry in a manner which cannot fail to meet with universal approval. The epilogue could equally well have served as a prologue: "Proud of the records and achievements of the industry in the past, strenuous and efficient in our efforts in the present, and confident in the future, shall we continue to play our part in serving the convenience and best interests of the community." We are all proud of the past; and, if our efforts are strenuous and efficient in the present, our confidence in the future may be of a truly sterling order. We can point, as the President does, to the increasing importance of the industry, to the variety of its work, to the growth in the applications of its products, to the flights that the consumption of gas is making in the public service (particularly for heating purposes), and to the national advantage there is in the progress of efficiency in our operations, which has caused more to be produced per ton of coal carbonized, and more work to be realized by the consumer per unit of product expended. But as we read on, it is seen how many problems await solution, how much there is to be done, to enable us to contend, by our maximum inherent strength, with conditions which do not apply to the past, but which do to the present, and will do so still more in the future. More, too, is being done now in trying to envisage from the present stage of affairs, and the nascent circumstances which we know will materialize and become operative forces, what we must do to counteract their effects upon our interests. Such work must be regarded as having imposing importance. We hope the address will do much to convince of necessity those who, gratified with the present progress so far as gas consumption is concerned, are content to take no thought for the morrow.

Of the progress of the industry in efficiency and service, the President gives a brief review in the early part of the address. In it he mentions that the statutory part of the industry is responsible for the carbonization of over 17 million tons of coal per annum; and he speaks of how its advances in technical efficiency have made those 17 million tons go much farther in the national and industrial interests than before. If we went back a couple of decades, our advances would be more pronounced than by a simple comparison of five years. But taking the returns for 1920, it is seen that the statutory concerns in that year carbonized 17,566,316 tons of coal, from which 256,977,744,000 c.ft. of gas were made. In 1924, 17,329,180 tons of coal were utilized, from which 275,225,839,000 c.ft. of gas were produced. From these figures, it will be seen that, although there was a lower consumption of coal, there was an increase in the quantity of gas made of 18,248,095,000 c.ft. This extra make was considerable, having regard to the lower quantity of coal carbonized; and it was not due to the increase in the amount of water gas made, inasmuch as in 1920 the water gas produced amounted to 36,932,530,000 c.ft., while in 1924 the quantity was 39,268,220,000 c.ft. We do not suppose that on the thermal basis the increased make would show any great variation from the increased efficiency lesson of the figures quoted, seeing that in 1920 most gas undertakings were still operating under more or less war-time conditions in respect of calorific value per cubic foot. In this connection, the President called attention to the comparative potential heat units per annum delivered to consumers, as recently given by Mr. Thomas Glover, of Norwich, which show how vast as a supplier of heat is the industry in comparison with the electricity industry. From gas-works, there are supplied as gas 122,472,000 million B.Th.U.; as coke, 262,906,000 million B.Th.U.; and as oils, 32,659,000 million B.Th.U. From electricity works, the total output of B.Th.U. is only 17,697,000 millions. These figures are both eloquent and instructive.

Passing to the portion of the address in which the President calls attention to the fact that there are important current events which give rise to many reflections on the position and future of the gas industry, he says there is a clear and an insistent call to reconsider and examine the position with a wider vision and a new horizon. In this connection, he takes us back to nearly half a century ago, when electric lighting first appeared in our midst, and general legislation followed for the control of the then incipient electricity industry. Here he says: "The position "of the gas industry to-day is an eloquent answer to the "fears of that time, which might well be taken to heart by "the faint-hearted now." Lest it should be thought that the President is accusing those who are circumspect, and consider it well to prepare for what they see before them, let us at once say that all that follows in the address is a denial of any such interpretation being placed upon his words. A prudent consideration of our position, with the view to legislating for the future, does not denote faint-

heartedness. If we look back fifty years, and consider the immense progress that has been made during that period by both the gas and the electricity industries, we see a condition of things which is not by any means analogous to that which now exists. Fifty years ago incandescent mantles were not with us in practicable form; the cooker load had not made any considerable advance; gas-fires had not commenced seriously to develop; and the prepayment system was a thing then unborn. Those advances (combined with our progress in manufacturing and distribution efficiency, together with public service and a high standard of commercial activity) are the implements which, with their improvement, have enabled the industry to make such remarkable growth in the face of a strenuous electrical competition. We do not see anything before us which can be likened to the effects of the cooker, the gas-fire, the prepayment meter, in inaugurating for us a completely new line of business. But what we do see is that the electricity industry has also made remarkable strides, and is likewise exercising itself in rendering within its limits the highest public service of which it is capable, and of developing its business to the greatest advantage. Now we are in competition with that industry, with the coal merchants, with the oil industry, and with domestic coke from the coke-oven industry, with bitumen for road purposes, and with synthetic nitrogen from the atmosphere. On the other hand, there await attack those 35 million tons or so of coal which are still being utilized in the domestic grate. We have also in industry a large waste of raw coal, a considerable part of which the gas industry is quite capable of displacing by gaseous or solid smokeless fuel. In view of all these circumstances, despite our luxuriant progress in the sale of gas, it is patent that in the present we have to work and provide for conditions which will enable us to meet our rivals on good ground, and to capture a continuously increasing rate of business for the purposes of light, heat, and power.

It cannot be said that the gas industry has always looked forward with sufficient vision. We see this in the President's address where he speaks of the combination of gas and electricity supplies, which he favours in suitable circumstances. He opens his review of this matter by saying: "It is a strong personal view that the gas industry, "as the premier public service suppliers of light, power, "and heat, missed a valuable opportunity when it failed "years ago to undertake electricity supply in combination "with gas." In speaking of tar, Mr. Botley says: "It is "probably correct to say that the high price realized for "this bye-product some years ago was not altogether an "advantage, because its use became restricted for certain "purposes, and opportunity was given for the introduction "of competitive material." Then, again, much of the work that is being done in connection with the gas industry to-day—through the Institution educational scheme and through research, and the developments that have been, and are still being, made in public service, together with the promotion of the movement from the parochial state of gas supply to greater latitudes—are all significant of things missing in the past which are acknowledged to be imperatively necessary in these times. Thus it is we have to consider our conditions as they stand to-day, and not as they were half-a-century ago; and there is no question that the work that is being done (through vision and appreciation of needs) in providing for highly-trained responsible men to carry on the gas industry in the future, in facilitating research, and in raising the standard of public service (all of which have valuable effects upon our economic state, and the efficiency of our manufacturing and utilization work) has placed the industry more securely on the high-road to the protection and advance of its interests in the future. Regarding research, through it the gas industry hopes to develop its fundamental process of gas production as so admirably sketched by the President, and to learn more and more of how to produce and deal with our various secondary products, in order to make them more and more acceptable, and so meet their competitors on more favourable ground; also to give to consumers the means of obtaining, through higher efficiencies, more economy in the consumption of gas. In connection with the secondary products, we are glad to see the recognition by the President of the important contribution which the Coke Competition made to our knowledge of the principles governing the production of good combustible coke, and to valuable ideas for the betterment of the marketing of that commodity. We quite agree with him that the amount the industry is spending on research is entirely inadequate—that is, having regard to the importance of bringing the highest possible standards, in both producing processes and utilization, to bear upon our interests in the time to come. In that time there is no doubt the gas industry will have to take a larger and more important part in the fuel problems of the country; and this is likely to be brought about through the proposal of the Royal Commission on Coal that a National Fuel and Power Committee should be formed, and that the industry should participate in the advisory work.

But important as they all are, are these developments enough, having regard to the future? An emphatic "No" can be given for an answer. There are several other ways by which the industry can establish itself on a higher plane of public service; and some of them were referred to by the President. They have been under discussion for some time past in our columns, and were specifically referred to by the President of the National Gas Council (Mr. D. Milne Watson) in the address to that body as published in the "JOURNAL" last week. There is, for example, amalgamation of well-conditioned concerns with undertakings operating under poor economic conditions, and the supply of gas to their areas through high-pressure mains; or, alternatively, by furnishing them with a bulk supply, or by joint working under conditions which it is not difficult to define. "If by concentration of plant, or "amalgamation, or anything similar, we can give a better "service, it is our duty to do so, and incidentally we "thereby strengthen our industry." Those are the words of the President; and we heartily endorse them. A badly-supplied small district may do an infinite amount of harm to the reputation of gas; and it is the duty of all concerns well placed for the production of gas on the most economical lines to see that, within the compass of practicable operations, the reputation of gas is nowhere allowed to suffer. Competition will take advantage of every weakness or deficiency in our service, and thereby advance its own interests. It is true that all these developments to which allusion has been made (there are several others in the President's Address) tend to bring to the gas industry new problems for solution; but the fact that such new problems arise must not deter us from facing the work which we know is demanded by the new conditions around us, and for the protection and advancement of the interests of the industry in the time ahead.

The address is highly opportune. It is an appeal to all to consider well their internal work, their environment, and the possibilities so far as they can be gauged, and to act accordingly. It is an address worthy of the high office which Mr. Botley has so faithfully filled, and will continue to hold until the annual meeting in September. Many other matters in it claim attention. But we must conclude, and will do so, with the remark that, by being "strenuous and efficient in our efforts in the present," we may have full confidence that the industry will advance to greater and greater heights in the service of the country, and to its own advantage in respect of stability and expansion.

A Burst in the Dam.

THE leaders of the Miners' Federation last week supplied to the nation and the miners fresh evidence of their crass stupidity and incompetence. A few plain words from some of the miners in the Mansfield area, and the beginning of a movement among the miners in the Nottinghamshire and Warwickshire areas to secure a return to work (a few hundred have recommenced), show that the solidarity about which we have heard so much is a sham. There are signs, too, that the Federation Executive see that the days for bullying the Government and the nation are drawing to a close. So much so is this the case that, if they do not act promptly, the likelihood is, unless they can by some miraculous means prevent the widening of the breach in their dam, the miners themselves will settle this strike without the aid of the Federation, which would be a humiliating experience for men who, with "Cook-oo" persistency and monotony, have been crying: "Not a "penny off wages, not a minute on hours," without a

reasonable suggestion as to how this is to be managed in the present or prospective state of the coal industry.

The leaders did make a suggestion last week, and thereby added to their reputations for foolishness. They proposed at the interview with the owners that the price of coal to home consumers should be raised by (say) 3s. a ton, so that wages and hours conditions for the miners could be maintained; and they instanced gas and electricity undertakings and railways as industries "which flourish on cheap coal." And these would-be dictators and wreckers of the country's interests further pompously announced that they were not prepared to carry other industries on their backs. Apparently they know nothing of the inter-relationship of industry. But let that pass. It seems to us that it is the other industries that have been carrying the mining industry on their backs, through the high price of coal, due to the crippling drop (through the Federation policy) there has been in the production per man-shift owing to seven-hour working and the overmanning of the collieries, which conditions have combined to make the cost of output such that this country is placed at a serious disadvantage in the markets of the world. They added, to the insensate idea that prices should be raised, the proposal that perhaps a subsidy could be obtained to assist the export coal trade. What the miners of other countries (from whom three British miners' leaders were begging for money less than a fortnight ago) will think of that, we do not know; what the effect on our home industries would be with cheap coal abroad and dear coal here, as well as upon the British mining industry and all employed in it, can be readily pictured, if not capable of being reduced to, and presented in, positive figures. The same leaders also told the owners that the men who came out on strike would all go back together. They are as weak in prophecy as they are in politic leadership. That the men who came out on strike will all go back together is an absurdity and impossibility; and it is the Miners' Federation who have made it so. After this prolonged struggle there will not be work sufficient for all the miners. This country has been losing trade and production; other countries have been busy, and have secured the contracts. Coal business has been lost; and contracts for coal which would have come to this country have now been fixed-up in other countries, and many of them, we learn, for long periods. For short-sightedness and pigheadedness the Executive of the Miners' Federation easily take the lead among the trade union leaders not only of this country, but of the world. The biggest enemies of the interests of the coal workers are the men who, on their behalf, brought about the strike, and have refused to see things in their proper light.

The manifesto from miners in the Mansfield district correctly sums-up the leaders. In it those who signed it said their trade unions were in the hands of men who placed political ambition and revolutionary projects before industrial welfare. There is a vast truth in that. From the beginning of this bad business, which commenced soon after the war ended (by the way, through it the country in that period has spent over 60 millions sterling in subsidies), it has been manifest that political motives, and not the real welfare of the miners, have actuated the leaders of the Federation; and their operations have been such that they have managed to keep the truth from the men, and have succeeded in leading them along the road to disaster. The same Mansfield document states: "We "are bitterly opposed to the right being taken from us "to determine whether or not we shall work;" and, further: "We are the victims of a policy we have neither "made nor believe in, and are earnestly desirous of "bringing to an end once and for all these devastating "disputes." That manifesto requires free circulation in all the mining districts. It shows, at any rate, that all the miners are not devoid of reason, which seems to be a property of insignificant proportions at the headquarters of the Federation.

A great deal, too, has been heard during the past week regarding the financial support the miners are receiving from Russia; but after all, what is coming to hand is but a drop in the ocean of financial requirement of a strike of this magnitude. Some question has arisen as to whether the money comes from the Soviet Government or from the Russian miners. Mr. Cook asserts it comes from the latter. The Soviet Labour Code provides six hours a day for men working underground, or 42 hours a week, which suggests a seven-day working week; but the hours commonly worked are eight to ten per day, and the men earn the equivalent of 25s. and in some cases 27s. 6d. per week! Is it likely these men, working ten hours a day, would provide funds to help the British miners to work seven? Is it likely that these men earning 25s. or 27s. 6d. per week would subscribe money for the support of men who were earning much more than that at the time their leaders issued their instructions to stop work? Such altruism on the part of the Russian miners is unbelievable; there is something more sinister at the back of this financing, and it has a political base. Of that there can be little doubt. But while money is coming from Russia, coal is passing to this country in increasing quantities from Germany, Belgium, France, and America. The promises of the miners abroad are not being honoured, as those who promised do not happen to be the rulers of the world. The Executive of the Miners' Federation, unless they are acutely blind, must see that the game is almost up, and that the castles they foolishly built upon running sands are cracking and tottering to their final fall. It is time, too, that the miners refused to continue to be the dupes of these men, who are, there can be little question, attempting to wreck not only the mining industry, but all other industries in the country, and to build upon the wreckage the conditions that to-day exist in Russia.

Oil From Coal.

IT is obvious to all who are aware of the facts that in the time to come this country will have to rely more and more upon its own production of oil. For protection in periods of war and other emergency, it is merely a matter of precaution and foresight that this country should at once very seriously occupy itself in ascertaining precisely what can be accomplished in this regard. Imposing, however, as is this question, it is left very much to individual investigators; and, sorry as we are to say it, there is no really effective systematic work being done in regard to it from the national point of view. Sooner or later—and the sooner the better—it will have to be taken in hand very thoroughly in the interests of the country; and whether or not the gas industry at present fully realizes it, we venture to predict that it will find, as time passes, that it will have to be intimately and actively associated with oil production, in view of the place the industry occupies as one of the two chief carbonizers of coal in the country—in fact, the largest one if we have regard to continuity of operations, inasmuch as the coking industry is largely dependent upon the condition of the iron and steel industries, and at times its work ceases with any stoppage in the coal industry, of which we have now had two outstanding illustrations since the war.

In view of this, the contribution which we commence to publish to-day on "Oil from Coal," from the pen of Mr. Harald Nielsen, will be both interesting and instructive. What Mr. Nielsen has done is to make a thorough survey of the published results of work on the subject, and to select from it those parts for his guidance in making independent investigations (with his assistants) on behalf of the Company with which he is identified. But his exploration of other men's work has not led to anything of a valuable nature other than in that of Prof. Fischer and Prof. Bone, and in a subsidiary degree a few other men. The slender harvest he has reaped from other work (with the exceptions mentioned) is probably due to reticence as well as inconclusiveness. However, he acknowledges how much he owes to Prof. Fischer for having provided the only methods applicable to the fundamental examination of oil by which concordant results can be obtained; while in Prof. Bone's work he finds the corroboration of results which he and his assistants have realized. We cannot here refer to the details given by Mr. Nielsen in his contribution; but from it there emerge certain salient points which have, we believe, a far-reaching importance.

For example, from the work there emanates what the author describes as the highly interesting fact that, provided an oil is a primary product in the true sense of the

term—that is, an oil product with little or no secondary decomposition—and has been obtained under proper conditions and strict temperature control, all the neutral oils from bituminous coals are identical, irrespective of the coals' districts of origin, their coking or non-coking characteristics, and differences in their periods of formation. There is insistence upon this in the article, for later we find the author again asserting, with confidence, that the true primary oil products obtained from varying grades of bituminous coal are identical not only in composition, but also in specific gravity, relative percentage by weight of fractions, and physical properties. The bearing of these observations cannot be over-rated, because they make it clear that, by suitable treatment, a uniform crude oil can be obtained from the various bituminous coals in this country, which, if substantiated by further work, opens up the possibility of producing standard oils throughout; the oils being amenable to the same refining treatment and miscible in all proportions. This is contrary to views which have been expressed by certain other investigators—for instance, Messrs. Sinnatt and King, of the Fuel Research Board, who believe that the variations in the properties of a tar are entirely due to the nature of the coal treated. This is in direct opposition to the finding which Mr. Nielsen presents in his article; and he emphatically states that, since the coal substance is not, and cannot be, at fault in respect of the properties referred to, the retorting system must be. It is his view that Messrs. Sinnatt and King employed a retorting system which permitted of secondary reactions and cracking of the primary products, however carefully worked. Hence the oil on which they conducted their researches was not a true low-temperature one, but a mixture of primary and secondary products. Dr. Thiessen, in his lecture on the microstructure of coal before the Royal Society of Arts last March, asserted that all the constituents of coal—from brown coals to anthracites—can be easily traced, and all of them are alike, constituent for constituent. It is held by our contributor that this has been proved by his own work; and he writes with some assurance when he says that he believes that the key to the solution of the constitution of coal is close examination of the primary oils. If this is confirmed (and it appears to be by Prof. Bone's researches), then we are truly advancing along a line of fresh revelation.

In dealing with the conditions for obtaining a true primary oil, Mr. Nielsen, in comments upon Table III., gives our vertical retort friends the reasons why, in his opinion, such retorts, even with internal heating, do not give true primary products; but although for this purpose he is manifestly a strong advocate of internal heating, and naturally presents the "L & N" process as being the ideal one for producing the heavier and lighter primary oils from bituminous coal, which can meet the demand for every grade of oil, he does not, in this matter, make complete pariahs of those whose systems apply external heat. In this case a large volume of protecting gas or steam must be admitted, so that the oils set free do not get into contact with any surfaces or zones of temperatures higher than those at which the oils were evolved in the first instance. That is the chief way of salvation, with primary oils as the first consideration; and there are also set out in the article eleven supplementary distillation conditions which must be observed, but they are all of a practical nature, and are clearly defined. Speaking of the "L & N" high-boiling neutral oil, the author mentions as a remarkable property the thermal stability; also that from them can be obtained a lubricating base which will meet all the demands and tests applied to the usual well-oil lubricants. The article is likely to raise some controversy among those who have put their faith in the Bergius process, as an examination of that system by Heyn and Dunkel leads to the conclusion that, from the crude Bergius oil, it is not possible to obtain all the oil required for either national or industrial purposes, as some of the most vital ones are missing. The Bergius oil is also accused of being of a highly unstable character; and justification is submitted for the assumption that the process is a cracking one. It is not denied that the process can supply light oils, motor fuel in particular; but there are other products of prime importance, notably the lubricants. Here we have introduced Fischer and Tropsch's "Synthol" process, which is somewhat similar to the Badische one. By these avenues of consideration and investigation, we arrive at the author's conclusion that the "ideal process for producing oils from bituminous coal which can meet the demand for every grade oil will be the 'L & N' process for heavier and lighter primary oils; and thereafter the Fischer-Badische for motor spirits."

The article is packed with interesting matter, to which this review—necessarily very fragmentary—will serve to direct attention. One thing that it is safe to say is that the contribution is one which advances knowledge on a subject of capital importance, particularly to a country at present almost completely dependent upon oversea sources for its oils, and largely so for its motor spirit.

Bye-Products and Rating in Scotland.

We have received from the Secretary of the Scottish District of the National Gas Council (Mr. J. W. Napier) a copy of the annual report of the Management Committee for the year ended March 31 last. It is an interesting document, and indicates how essential such a body is in looking after the general welfare of gas undertakings. The increase of membership last year from 66 to 72 company undertakings and from 44 to 45 corporation undertakings shows that the work is highly valued by those responsible for the administration of Scottish gas concerns. There are only two parts of the report which we will emphasize, as the complete document appears in later columns. In the first place, we have illustration of how the liquid products of coal carbonization have diminished in value in Scotland, as in other parts of Great Britain. Across the Border, the scheme for the sale of tar and ammoniacal liquor to distillers operates highly successfully; but the depreciated values are shown by the monthly awards of the arbiter, whose figures are f.o.r. distillers' works. So far as tar is concerned, there has recently been an improvement. In April last year, the award was 22s. 7½d. per 100 gallons, and, although there was a small increase during the succeeding three months, by September the figure had dropped to 21s. 10d.; but since then it has moved up until March records a price of 29s. 11d., which, by the way, is 19s. 8d. less than the average figure for 1923-24. This shows that there is a good deal of leeway to be made up in Scotland, as elsewhere, in respect of the market values of tar. Regarding ammoniacal liquor (4° Twaddell), the award in April last year was 2s. 7·75d. per 100 gallons. This figure also obtained in May; but it appears to have stabilized itself at 1s. 6·75d. for the remainder of the year ending with March. The average for the year is 1s. 9d. per 100 gallons, which is a shilling less than the preceding year, and compares with 3s. 6·5d. for 1923 to 1924. Scotland is identifying herself with the British Road Tar Association, and, through that Association, there is no question that excellent work will be done, which must eventually reflect itself in the value of the product.

The only other matter to which we wish to call attention is the Rating (Scotland) Bill. From an investigation made by the Scottish District, it was found that in a number of cases the Bill would impose a considerable extra sum in the shape of taxes upon gas undertakings, though, in other instances, the concerns would be called upon to pay a less amount. The Management Committee are of opinion that the position of gas undertakings as public utility services is, by reason of their peculiar position, clearly marked out from other heritable subjects, and they are therefore entitled to generous consideration in the matter of valuation and rating. It is pointed out that a substantial portion of gas undertakings in burghs at present receive a concession of 75 p.ct. on the value for pipes; but there has long been complaint that gas undertakings have otherwise been too highly valued. It is not suggested that it would be desirable to split-up undertakings into portions for the purpose of arriving at deductions, which would be against the intention of the new Bill to produce, as far as possible, reform on the basis of simplicity and uniformity. It is, however, submitted that it is not unreasonable to urge that at least 25 p.ct. deduction should be aimed at under the new system that is proposed. The deduction from the annual value as

provided for by section 11 of the Bill is 20 p.ct. in the case of gas undertakings; the deduction being uniform for all rating purposes—county, burgh, and parish. The suggestion that the 20 p.ct. should be increased by 5 p.ct. appears to us to be simply a matter of justice. The Management Committee also submit that the clause of the Bill dealing with the valuation of machinery should be deleted.

Flueless Rooms.

ECONOMY can be carried to a point at which efficiency suffers; and it appears that this is happening more extensively than is good for the health of the occupants of some of the new types of houses which are being erected. Recently we made an inspection of certain new houses in two separate districts which have been built on the bases of structural economy and domestic labour saving. The latter is all right; but the structural economy is being pursued to an extent which places a bar to the tenants' desire for comfort, convenience, and household economy, at the same time depriving them of healthful conditions which it is essential should be protected. In some of the bedrooms of these houses, there are no chimneys or flue outlet provision; and ventilation is merely served by a grating near the top of the room which can easily be stuffed up by the occupant. The houses are electrically lighted; a gas cooker, gas-heated water circulator, and gas-fires are in other rooms; but the only means of heating the rooms in which no provision of a chimney or flue outlet has been made is a plug attached to the lighting circuit for a radiator—thus establishing conditions under which gas-fires cannot be employed. This is inimical to the interests not only of the tenants, but of the gas industry. A forcible article on the subject appears in later columns from the pen of Mr. Arthur Forshaw, M.Sc.; and to the points in the contribution the attention of the National Gas Council and the British Commercial Gas Association may be directed—seeing that this is a matter of considerable importance to the future development of the gas heating business, and to healthy room conditions. One difficulty is that local authorities have considerable controlling power in connection with the houses in their areas; and those authorities who are traders in electricity will probably favour room construction which gives an advantage to their commodity. It seems clear that nothing much can be effectively done in this matter without the aid of amending legislation; but it would take much time to secure the adoption of such legislation, and (if successful) to bring it into effective operation. However, efforts should be made to cause the provision of proper flue outlets for heating and ventilation to be a matter of compulsion. An attempt might be made to obtain the insertion of the necessary clause in the Smoke Abatement Bill. There is no question that the matter is so pressing that it should at once be taken in hand in the direction of legislation, as well as in that of endeavouring to bring about the conversion of local authorities to the realization of the underlying hygienic and economic facts—from the tenant's point of view. Upon local authorities great responsibility rests in this matter; and it is well that they should, at the initial stages of this new mode of designing and building rooms, realize their position and obligations in regard to it.

Stamping of Meters.

An important communication on this subject has been received from the Institution of Gas Engineers, and is published in a later column. Due to misapprehension, it appears that unstamped meters are being used for the registration and sale of gas. This is illegal. Under Section 13 of the Gas Regulation Act, all meters—new or repaired—must be officially stamped.

Sulphate of Ammonia Shipments.

The export business in sulphate of ammonia still shows a declining tendency. The quantity shipped in April was 15,711 tons, compared with 19,445 tons in April, 1925. Up to the end of April, the exports this year totalled 82,200 tons, as against 99,052 tons during the same period of 1925. There has been a considerable drop in the demand from Spain and the Canaries. In the four months, their requirements were met by 18,053 tons, compared with 39,995 tons in the same four months of 1925. Italy also receded by purchasing only 1619 tons, as against 7087 tons in the corresponding period of 1925. The Dutch East Indies is somewhat better, and so is Japan; the former having purchased 16,417 tons, as compared with 15,167 tons in the corresponding period of last year, and the latter 21,360 tons, as compared with 17,082 tons in 1925.

A Lapse by the Promoting Group.

The promoting group identified with 43, Cannon Street and numerous other addresses, have been caught failing to file their annual summaries of accounts at Somerset House in the cases of two companies—the Warwickshire and South Midland Electricity Supply Corporation and the Electric Light and Power Contracts Finance Corporation. At the Birmingham Police Court, a fine of £20, with £5 5s. costs in each case, was imposed. That much-used Baronet (Sir Charles B. Herne-Soame) and six other Directors were fined £20 each for permitting the default. Walter Thompson, who, as a solicitor, spreads his professional activities over most of these companies, or alternatively as a Director, happens in these cases to be a member of both Boards, and so he escaped with one fine. James Brigden got off with a fine of £10, as he joined the Board of the Finance and Contracts Corporation at the end of last year. The defence was that the omissions arose through a dispute with a firm of accountants who kept the books; and the death of the Secretary of both companies was another attributable cause. Enough said.

Chalk for Fuel!

Opportune in the time of its appeal, but inopportune from the point of view of investors, there comes the prospectus of the Chalk Fuel, Power Gas, and Bye-Products Company, Ltd. The share capital, it is proposed, shall be composed of 60,000 10 p.ct. participating preference shares of 5s. each; 20,000 founders' shares of 1s. each; and 50,000 debenture bonds of £1 each. The preference shares, to the number of 28,198, are offered at par; 16,291 founders' shares at 5s. each (400 p.ct. premium), and all the debenture bonds at par, although they carry (on paper) 9 p.ct. interest. Any balance of net profits, after providing for the dividend and interest mentioned, and for a sinking fund, will be equally divided—one part going as extra dividend to the preference shares and the other part to the holders of the founders' shares. Already enough is seen to make us fight shy of this new venture—whether we have regard only to the title or to the tempting form in which the capital is dangled before us, with a wealth of profit foreshadowed. In an accompanying letter, the concern is humorously described as one of "national importance," and "*may* result in a substantial profit on your *speculation*." There we have a good hint—the "may" and the "speculation" should safeguard even a dolt from risking his money. Looking farther down, we see the registered office is 4, Great St. Thomas Apostle, E.C.; but Sir Charles B. Herne-Soame, Bart., of 43, Cannon Street fame, is the Chairman, and Major James Brigden is a Director—the others being Edward Warden (without a "Mr." or "Esq."), Robert G. Harley, Esq., and Lieut. J. Waring. The Company have no works, but hope to have a place for manufacture when entrusted with the money. The coal strike will, we hope, be over long before then. The process is said to be a "secret" one. We do not like "secret" processes as an investment; but from what we gather from the prospectus and other printed material, we think there would be little difficulty for a divulging analysis to be made of one of the briquettes—thus speedily setting loose the "secret."

The Briquettes.

The chalk briquettes for domestic purposes, it is stated in a print accompanying the prospectus, will be made ovoid shape, and be 3 oz. in weight; for industrial purposes, 3-lb. blocks will be made. The principal ingredient is to be chalk, which will be mixed "with 10 p.ct. of a rich carbon substance subjected to special treatment." We are not told where the "rich carbon substance" comes from; but it is to be finely divided, and specially treated, so as to bring out all that is best

in the chalk from a fuel point of view. In the prospectus it mentions that the process enables cinders and household refuse to be converted into good fuel at a cost of 12s. 6d. per ton. Probably that is the source from which the promoters hope to get "rich carbon," or perhaps gas-works will be selling them coke breeze and pitch for the purpose. The heating properties of the "fuel" are wonderful; and all the evil effects of coal appear to be annihilated by this chalk fuel system. It is all very comical. Regarding the cost of the fuel, it is mentioned that, with efficient machinery, production, including raw material and labour, will not exceed 15s. per ton, so that the selling price could be 25s. to 35s. per ton—a very good profit! The first fuel plant which it is intended to put down would have an output of 100,000 tons per year; and this plant, it is estimated, would cost about £20,000. Reverting to the printed statement accompanying the prospectus, some testimonials are given from "experts;" but care is taken not to state who they are. One of them suggests that, for the making of producer gas, the new fuel has superlative merits. It is unnecessary in the columns of the "Journal" to deal further with such proposals. All that need be urged is that gas undertakings should do their utmost to see that their shareholders are not victimized by this fresh appeal for capital for a company promoting scheme which, in our opinion, can only end in dead failure.

Contravention of Lighting Directions.

David Silver, a jeweller, of Oxford Street, W., has, we believe, been converted to the view that the Board of Trade Coal (Emergency) Directions, which were issued on May 1, were not prepared merely for the fun of the thing and with no intention that they should be effective. Mr. Silver appeared at the Marlborough Police Court last Saturday to answer two summonses—one relating to June 2, when eight electric lights were said to have been used for display illumination at his shop, and the second to June 4, when twelve lights were said to have been in operation. The case appears to have been strenuously contested; but in the result the Magistrate imposed a fine in respect of June 2 of £5, with £2 costs. The offence on June 4 was regarded as much more serious, seeing that a warning had been given to defendant. In this instance a fine of £50, or fifty-one days, with £5 costs, was inflicted. It is possible that Mr. Silver will appeal against the conviction. Anyway, the publicity given to the case has no doubt had good effect.

INSTITUTION OF GAS ENGINEERS.

Postponed Annual Meeting.

Writing regarding the new date for the annual meeting, the Secretary (Mr. Walter T. Dunn) says the Council, having discussed the various considerations involved, have decided upon Tuesday, Sept. 21, to Friday, Sept. 24. The detailed programme will be issued early in September. The President (Mr. Chas. F. Botley, M.Inst.C.E.) desires Mr. Dunn to express the hope that this enforced postponement will not adversely affect the attendance on the three days of the meeting, which will take place at the Institution of Civil Engineers, Great George Street, Westminster. It is proposed to hold the social functions and visits which have been already arranged. The President's reception will take place at the Connaught Rooms on Tuesday evening, Sept. 21; and the visit to Hastings on Friday, Sept. 24. Invitation cards for these two occasions will be issued early in September to all who have signified their intention of being present.

Evening Star Lodge.—It has been decided to hold an Emergency Meeting of the Evening Star Lodge at the Freemasons' Hall, London, on Monday, Sept. 20, to which the masonic members of the Institution of Gas Engineers (the postponed annual meeting of which opens on the following day) will be invited.

Society of Chemical Industry.—A full programme has been arranged for the annual meeting of the Society of Chemical Industry and congress of chemists, which will take place in London, from July 19 to 23, under the Presidency of Mr. W. J. U. Woolcock, C.B.E. Other Chemical Societies are cordially co-operating; and it is expected that representatives of foreign organizations will be present. Any interested persons are invited to apply for tickets of admission to the meetings, with the exception of the opening day, notwithstanding the fact that they may not at present be members of the Society of Chemical Industry or of the other chemical societies.

PERSONAL.

Sir Alfred Mond, M.P., has resigned his Directorship of the British Dyestuffs Corporation, owing to increased responsibilities entailed by his having assumed the Chairmanship of Messrs. Brunner Mond & Co.

On June 7, employees of the Plymouth Corporation Gas Department presented, as a token of appreciation and goodwill, the late Engineer and Manager, Mr. W. P. Tervet, with a case of pipes, a jar of tobacco, and a pouch suitably inscribed in silver, and Mrs. Tervet with a silk umbrella.

The Directors of the Aldershot Gas, Water, and District Lighting Company on the 10th inst. appointed Mr. H. G. Wright, A.M.I.E.E., Engineer and Manager to the Cleveland Trust, Ltd., Electricity Works, Saltburn-by-the-Sea, to be Electrical Engineer to the Company. It is anticipated that Mr. Wright will take up his duties on the 24th inst.

We learn that Mr. G. L. Jennings, who is well known in the gas industry through his work for the Brentford Gas Company, has started practice as a Consulting Gas Distribution Engineer. Mr. Jennings, it will be remembered, contributed articles to the "Journal" on the gas supply to the British Empire Exhibition at Wembley, with which work he was professionally connected and for which he was largely officially responsible. His address is 67, Tarrant Street, Arundel, Sussex.

Mr. Ernest L. Burton has retired from the Secretaryship of the Southgate and District Gas Company, a position he has held for upwards of 31 years; also from the similar office, which he has occupied for 26 years, with the North Middlesex Gas Company. He has been appointed a Director of these undertakings. The vacancies have been filled by the appointment of his son, Mr. Hyde Clarke Burton, whose career has been of considerable interest. On leaving Uppingham School in 1916, he passed through the special entry for candidates from Public Schools into H.M. Navy, and after completing the requisite course of training at Devonport was drafted to the Grand Fleet (then at Scapa Flow), where he remained to the end of the war. He was then appointed to a destroyer, in which he served the next 15 months in the Mediterranean and the Black Sea; finally resigning his commission in March, 1920. Shortly after this, with the object of qualifying as a Chartered Accountant, he became an articled pupil to one of the partners of the well-known firm of Messrs. Cash, Stone, & Co. Having in due course passed the requisite examinations, he became an Associate of the Institute of Chartered Accountants, at the final examination of candidates for England and Wales, being awarded by the examiners the William Quilter prize for the best paper on auditing. Shortly following this he joined his father, and has since assisted him with his secretarial duties. He still retains his connection with H.M. Navy, being a Lieutenant on the Emergency List. For the past few years he has been prominent in Rugby football, obtaining his English cap against Wales in January last.

FORTHCOMING ENGAGEMENTS.

June 18.—Southern Association of Gas Engineers and Managers.—Visit to Bristol.
June 21, 22, 23.—Summer meeting of the Institution of Heating and Ventilating Engineers, at Scarborough.
June 23.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, under the presidency of the Rt. Hon. Sir Alfred Mond, Bart., M.P. Programme as arranged for May 5.
June 24.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at 28, Grosvenor Gardens, S.W. 1, at 2.30.
June 25.—Waverley Association.—Meeting in Edinburgh.
July 19.—Institution of Chemical Engineers.—Annual meeting.
July 19-23.—Society of Chemical Industry.—Annual meeting.
Sept. 9.—"B.C.G.A.," Midlands District Conference.—Smethwick.
Sept. 14-16.—Institution of Public Lighting Engineers.—Conference at Newcastle.
Sept. 20.—Evening Star Lodge.—Emergency Meeting.

Institution of Gas Engineers.

June 23.—Corbet-Woodall Scholarship Advisory Committee.
June 23.—Gas-Works Effluent Sub-Committee.
June 24.—Wrought-Iron Tubing Inquiry Committee.
July 10.—Education Conference.
July 12.—Emergency and Finance Committees.
July 13.—Advisory Committee on Education.
Sept. 21-23.—Postponed Annual Meeting.
Sept. 24.—Visit to Hastings.

North of England Gas Managers' Association.—The fourteenth half-yearly auxiliary meeting will be held at Hartlepool on Saturday next, June 19, when the chair will be taken by Mr. C. G. Barrett, Assistant Engineer and Manager of the Hartlepool Gas and Water Company, who will deliver an address. Afterwards, inspection will be made of No. 2 Works of the Company.

STAMPING OF METERS.

The following communication, signed by the President (Mr. Charles F. Botley, M.Inst.C.E.) and the Secretary (Mr. Walter T. Dunn), has been received from the Institution of Gas Engineers:

The Institution has been asked to call the attention of its members to the fact that the statutory requirements in regard to the stamping of meters are not in all cases being complied with.

The Council have therefore approved the issue of this Memorandum, for it can obviously only be due to misapprehension that unstamped meters are now being used for the registration of gas on which the payment by consumers is assessed. This is illegal.

The position is that under section 13 of the Gas Regulation Act, 1920, which reads as follows, all meters, new or repaired, must be stamped at an official testing-station.

Section 13 of the Gas Regulation Act, 1920.

All meters by means of which gas is supplied by any undertakers to any consumer shall be stamped in accordance with regulations made by the Board of Trade under their powers in that behalf, and if any undertakers supply gas by means of any meter which is not so stamped, they shall be liable, on summary conviction, to a fine not exceeding £10.

The Board of Trade issued Gas-Meter Regulations, Statutory Rules and Orders, 1920, No. 2354, dealing in detail with the matter.

It may be pointed out for information, and with advantage, that this matter has been receiving attention recently in many directions. The National Gas Council have had inquiries addressed to them, the Board of Trade have been referred to, and they issued a letter on May 20, reference I.M. 3298/26.

The Deputy Warden of Standards has been consulted, and naturally the Association of Statutory Inspectors of Gas Meters are interested.

No difficulty, however, will be experienced if steps are taken to comply with the requirement as indicated above.

EVENING STAR LODGE, No. 1719.

It has been the hospitable custom for some years past for the Evening Star Lodge—the parent Lodge of the three specially identified with the gas engineering profession and industry—to provide the occasion whereby the masonic members of the Institution of Gas Engineers attending the annual meeting of the Institution, when held in London, might assemble with members of the Lodge and their friends. For this purpose the Regular Meeting of the Lodge, which ordinarily takes place in May, was this year postponed to Monday, June 7, which everyone expected would be the date immediately preceding that of the opening of the annual meeting of the Institution. Unhappily the coal dispute, with all its consequences, supervened, necessitating the postponement of that meeting. Nevertheless, the invitations of the Lodge which had been issued still held good, and a number of Institution brethren resident in London and the Metropolitan district were present in response thereto. The attendance naturally fell far short of the number of original acceptances.

W. Bro. Alfred H. Henry (as W.M.), Bro. Fredk. G. Cockey (S.W.), and W. Bro. Arthur L. Croager (J.W.), met the members of the Lodge and guests in the De Grey Chamber of Freemasons' Hall, Great Queen Street, and extended to them a cordial welcome.

After the dispensation from Grand Lodge regularizing the gathering had been read by the Secretary, W. Bro. Rae P. Normand, P.M., and other formal business had been transacted, the ceremony of raising Bro. Leslie Walter Dunn (son of the Secretary of the Institution of Gas Engineers) was carried out. Bro. John A. Brentnall officiated as J.D., and Bro. Albert B. Potterton acted as S.D., in the regretted absence through illness of W. Bro. James W. Foreman. The office of Chaplain was occupied by W. Bro. Alfred C. Beal, P.M.

Investitures for the year 1926-27, which had to be postponed from the Installation Meeting in March, of W. Bro. Reginald W. Foster, L.R., as Chief Steward, and Bro. Thomas F. C. Potterton as Asst. Steward were proceeded with; W. Bro. Arthur Valon, P.M., L.R., being in office as D.C.

Grand Lodge certificates were presented to Bros. Claridge and Swan, the latter of whom acted as Organist in the unavoidable absence of Bro. John F. Simmance.

Mr. Arthur Maurice Bell, Lighting Superintendent of the Tottenham District Light, Heat, and Power Company, proposed by W. Bro. Arthur E. Broadberry, P.M., L.R., seconded by the W.M. (W. Bro. Henry), was balloted for, and was unanimously elected as a candidate for initiation.

It was announced from the chair that arrangements had been made by the Standing Committee for an Emergency Meeting of the Lodge to be held in connection with the postponed annual meeting of the Institution of Gas Engineers. Invitations would again be issued to members of the Institution; and the hope was expressed that there would be a long list of acceptances to honour the occasion. Thereafter, W. Bro. Arthur E. Croager, P.M., P.P.G.D., Kent, Treasurer, having made his usual statement, the Lodge was duly closed, and the members and visiting brethren repaired to the adjoining Connaught Rooms for dinner—W. Bro. Henry presiding.

The Loyal and the usual Lodge toasts having been duly honoured, W. Bro. Arthur E. Croager, P.M., in proposing "The Visiting Brethren," offered a hearty welcome to all who were with them that evening as guests of the Lodge. On their behalf response was made respectively by W. Bro. Arthur Fivar, of the Perseverance Lodge, No. 338; W. Bro. R. H. Sayers, P.P.A.G.D.C., West Lancs., of the Northern Star Lodge, No. 3053; W. Bro. R. J. Milbourne, P.P.S.G.W., Warwick, of the Murdoch Lodge, No. 3480; and Bro. George Evetts, of the Ewell Lodge, No. 1851.

The speeches were interspersed with items from an excellent musical programme under the direction of W. Bro. Herbert Townsend.

NATIONAL GAS COUNCIL—SCOTTISH DISTRICT.

The Annual Meeting was held in the City Chambers, Glasgow, on April 27—Councillor JAMES STEWART (Convener of the Edinburgh Gas Department) in the chair.

ANNUAL REPORT.

Gas Regulation Act, 1920.—Therm Method of Charge.—In Scotland, the number of Orders granted under section 1 of the Gas Regulation Act up to Dec. 31, 1925, was 32—corporations 28, and companies 4. This number is exactly the same as for the previous year, showing that the adoption of the Act has not extended in Scotland.

Scheme for Sale of Tar and Ammoniacal Liquor to Distillers.—The scheme continues in successful operation. The monthly awards by the Arbiter are as follows; the rates being f.o.r. distillers' works:

—	Tar. Per 100 Gallons.	Liquor (4° Tw.). Per 100 Gallons.
	s. d.	s. d.
1925.—April	22 7½	2 7·75
May	23 3½	2 7·75
June	23 4½	1 6·75
July	23 4½	1 6·75
August	23 1	1 6·75
September	21 10	1 6·75
October	21 10	1 6·75
November	22 1½	1 6·75
December	24 5½	1 6·75
1926.—January	24 8	1 6·75
February	25 6½	1 6·75
March	29 11	1 6·75
Average for 1925–26	23 10	1 9
" " 1924–25	23 0	2 9 1
" " 1923–24	49 7	3 6 5

Road Tar Propaganda.—In order to protect the interests of gas undertakings in maintaining and furthering the use of tar for road purposes, and to counteract the effects of the intensive propaganda of certain interests to substitute bitumen and bituminous compounds as a road making and road surfacing material, the British Road Tar Association has been formed. The Association will include coke oven producers and gas-works producers of tar. On this Board the gas industry will be represented. The Association is to be a separate organization, like the Sulphate of Ammonia Federation. Representation of the gas industry would be from the districts at present under the National Gas Council; the districts nominating representatives to a Central Committee. The basis of the Association is that it would be composed of *producers* of tar, whether the gas undertakings concerned distilled their own tar or sold it to distillers direct or through a co-operative scheme. Subscriptions would be on tar production, at a rate of 3d. per ton of tar produced annually. Scotland will be one of the districts. Your Committee recommend the proposed scheme, and that it should receive the financial support of the members.

Electricity—Government Proposals.—The whole subject has been dealt with very fully, and reports made to members direct from the Central Executive Board from time to time. In order that the interests of gas undertakings in Scotland in particular should be considered, a conference of representatives from this Board and Scottish Labour Members of Parliament was held on July 15, 1925, at the House of Commons. The case on behalf of gas was very fully discussed; and the members present stated that they were against subsidies, and that they were much impressed with the financial and industrial importance of the gas undertakings.

Rating (Scotland) Bill.—The following provisions of the Bill affect the rating of gas undertakings:

Section 11 provides, as per First Schedule, for the deduction from the annual value appearing in the valuation roll of 20 p.ct. in cases of undertakings of corporations or companies supplying gas for public consumption, and ex-

clusively used in connection with such supply. This deduction is uniform for all rating purposes—*i.e.*, county, burgh, and parish.

Section 15 affects tenants' plant, and deals with the valuation of machinery.

Enactments repealed which affect gas undertakings are, as per Third Schedule:

(1) The Poor Law (Scotland) Act, 1845—particularly section 37, which has reference to deductions from the gross valuation to be granted as at present by parish councils.
(2) The Burgh Police (Scotland) Act, 1892, section 347, which has reference to piping being assessed on one-fourth of the gross valuation.
(3) The Lands Valuation (Scotland) Act, 1902. This whole Act, which is an Amending Act, is repealed, and consists mainly of one section making provision as to what is "machinery fixed or attached."

Under existing arrangements:

(1) County rates are levied on the gross valuation.
(2) Burgh rates are levied on the gross for works; but as regards underground piping rates are levied on one-fourth of the valuation.
(3) Parish Rates.—The various parish councils allow deductions from the gross valuation varying from 5 to 75 p.ct. There is no uniformity of practice.

A questionnaire was issued to gas undertakings asking for information as to the effect of the Bill on the sum paid for assessments, (*a*) under the existing method; and (*b*) under the Bill. The information obtained showed that in a number of cases the extra sum to be paid in taxes would be considerable. In a number of instances a less amount of taxes would be paid.

Your Committee have held a number of meetings, and a large amount of information has been collected. Gas undertakings, along with other public utility services, by reason of their particular position, are clearly marked-out from other heritable subjects, and are therefore entitled to generous consideration in the matter of valuation and rating. A substantial proportion of gas undertakings in burghs at present receive a concession of 75 p.ct. on the valuation for pipes. There has long been complaint that gas undertakings otherwise have been too highly valued; and, while it is not suggested that it would be desirable to split-up undertakings into portions for the purpose of arriving at deductions (that being against the spirit of the new Bill, which quite properly is intended to make for simplicity and uniformity as far as possible), it is not, it is submitted, unreasonable to urge that at least 25 p.ct. deduction should be aimed at under the new system that is proposed.

Your Committee unanimously agreed as follows:

(1) That under the First Schedule of the Bill the deduction to be allowed from the annual value of gas undertakings for the purposes of rates should be 25 p.ct., instead of 20 p.ct. as proposed.
(2) That clause 15 of the Bill, dealing with the valuation of machinery, should be struck out.

Gas Pipes in Streets—Right to Break-Up Roads.—The position of a gas company (non-statutory) in respect of their rights to break-up roads belonging to a local authority is frequently challenged, and difficulties arise from time to time. There have been cases where local authorities have sought to impose upon gas undertakings substantial payments for way-leave. In connection with this subject, your Committee has ascertained the legal position, and information dealing with points that may arise is at the disposal of the members.

Membership.—The number of Scottish undertakings in the membership of the National Gas Council is as follows: Company, 72 (last year 66); corporation, 45 (last year 44).

General.—During the past year many important matters affecting the gas industry, particularly of a legislative character, have been dealt with by the Central Executive Board in London, and are referred to in the monthly reports circulated to all members. The Secretary has received by correspondence throughout the year many inquiries for information on a variety of subjects. Members desiring information on any subject are invited to communicate with the Management Committee through the Secretary.

The following appointments were made for 1926-27:

Management Committee.

Chairman.—Councillor James Stewart (Edinburgh).
Vice-Chairman.—Bailie Slorach (Hamilton).
Secretary.—Mr. J. W. Napier (Alloa).
The following twelve members.—Messrs. James Campbell (Dunfermline), James Dickson (Dundee), T. W. Harper (Ayr), L. Hislop (Cowdenbeath), George Keillor (Greenock), John Lang (Alexandria), Samuel Milne (Aberdeen), J. W. McLusky (Glasgow), J. M. Smith (Stirling), Bailie Stewart (Perth), W. E. Whyte (Lanarkshire), and John Wilson (Motherwell).

Representatives on the Central Executive Board, with Year of Retiral.

J. W. Napier (1927), L. Hislop (1928), Councillor Stewart (Edinburgh) (1929), and Bailie Slorach (1930).

INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A Meeting of the Council was held at 28, Grosvenor Gardens, Westminster, on Tuesday, June 8, Mr. Charles F. Botley, the President, in the chair. There were also present Mr. John Wilkinson and Mr. H. D. Madden (Vice-Presidents); Messrs. John M. Campbell, John W. McLusky, Hubert Pooley, Charles S. Shapley, C. Dru Drury, Douglas H. Helps, John Terrace, C. Rhodes Armitage, W. H. Bennett, and Harold E. Copp (Ordinary Members of Council); Frederick A. West (Eastern Counties Association); Jesse O. Halliwell (Irish Association); W. W. Atley (North of England); William H. Johns (Wales and Monmouthshire); J. Ferguson Bell (Past-President), and W. E. Price (Hon. Secretary).

The minutes of the previous meeting having been confirmed, the question of the date of the postponed annual meeting was considered, and it was decided that the meeting be held on Tuesday, Wednesday, and Thursday, Sept. 21, 22, and 23, concluding with a visit to Hastings on the following day.

Mr. Percival J. Channon, of Newport Pagnell, and Mr. Herbert D. Lees, of Hexham, were transferred from the class of Associate Member to that of Member; and Mr. Harold J. Stanley, of Goring-on-Thames, was admitted as a Student.

The name of Mr. H. Townsend, formerly of Wakefield, was, under the provision of Article 16, placed on the list of aged members of the Institution who have distinguished themselves in their professional career.

The Emergency Committee were appointed scrutineers for the examination of the balloting lists recently issued for the election of members, associate members, and associates.

Recommendations of the Gas Investigation Committee with reference to the researches on carbon monoxide and carbonization were adopted, the work to be continued along the lines on which it was started.

A Sub-Committee of the Gas Investigation Committee (with power to co-opt) was formed to deal with the question of gas-works liquor effluents, and Dr. A. C. Monkhouse (the University, Leeds) was appointed Research Chemist. It was reported that Dr. Parker had already commenced an inquiry with a view to eliciting the most urgent problems in connection with this investigation.

Communications were considered from the Society of Technical Engineers with respect to a movement they have in hand having for its object the registration of engineers. It was agreed that further information on the proposals be obtained, and referred to the Emergency Committee.

A letter from the Cornish Association of Gas Managers was considered calling attention to the condition of Murdoch's house at Redruth, the first building illuminated by gas. It was resolved that Mr. S. J. Ingram, of Truro, be asked to report on the subject.

Consideration was given to a letter from Mr. R. E. Gibson, of Liverpool, suggesting that Clause 29 of the Standard Conditions of Contract agreed by the Institution and the Society of British Gas Industries be amended to provide for a single arbitrator, as being much more satisfactory than two (as at present) who may have to refer the matter in dispute to an umpire. The Council were not in favour of the alteration suggested. It was pointed out that, in the drafting of any general conditions of contract, the provisions specified in the standard conditions could be specially modified if required in any particular circumstance, by agreement between the parties concerned.

A letter was reported from the Kelvin Medal Award Committee requesting the recommendation of the Institution of Gas Engineers as to a suitable person for the receipt of this honour, which is awarded every three years. After discussion the Emergency Committee were deputed to decide upon the nomination at their ensuing meeting.

At the instance of Mr. S. B. Langlands, of Glasgow, it was agreed that a memorandum be issued to members of the Institution calling their attention to the legal necessity for the official stamping of all meters used by consumers for the registration of gas.

Coke Firing for Steam Boilers.—An article on coke firing for steam boilers and the advantages of blending, by Mr. E. W. L. Nicol, Expert to the London Coke Committee, appears in the June issue of the "Engineering and Boiler House Review." The author explains the advantages of his well-known "Sandwich" system, and points out that the precise proportion of coal to coke is determined by the analyses of the two fuels, and also by consideration of relative price and calorific power; the fuel showing the greater calorific value being used to the utmost extent consistent with good results. Usually, however, a 50 p.ct. mixture gives good smokeless combustion, and is considered most advantageous from the financial, as well as from the practical, viewpoint. Figures are given to show that the proportion of coal to coke may be so adjusted that the analysis of the composite fuel, as fed to the furnaces by mechanical means, is identical with that of relatively expensive Welsh smokeless coal.

ELECTRICITY SUPPLY MEMORANDA.

THINGS do not appear to be going well with the Electricity Supply Bill. The appalling number of amendments with which the Standing Committee have to deal, and the slow progress that is being made, are not heartening conditions. The Government, too, by this time have doubtless come to the conclusion that coal is much more important to the nation than electricity; and they find themselves in a fearful tangle, with little or no justification for it. Speaking of the coal trouble in the House recently, the Prime Minister said:

Worse and Worse.

> I have never concealed my view that the less industries have to do with the Government the better; but this doctrine is not absolute, it is relative. Most industries in this country, I am glad to say, do manage their own affairs without any help from the Government, and without troubling Parliament. . . . They would regard political interference not only as something wrong in itself, but as something which would condemn them as an evidence of failure to play their part. Their conception of their function is to manage their own business, and to make all interference on the part of the State superfluous. But that is not the story of coal.

In view of this statement we cannot conceive why the Government sought to interfere with the electricity supply industry. Either interference is not required, or it is the view of the Government that the electricity industry does not know how to manage its own business. Now, however, the Government find that fewer voices than ever are raised in favour of the measure. What voices there are have a peculiarly set political ring about them, while those that are opposed come from the seats of qualification within the electricity industry. The Government must have an increasing difficulty to persuade themselves that they are on the right lines. The advocates of the scheme have as their leaders Mr. Baldwin, Col. Ashley, and the Attorney-General, who are simply the mouthpieces of the Electricity Commissioners, who, having attached themselves to a policy, cling tenaciously to it—despite an overwhelming opposition of an equally competent character and more far-reaching in numbers. The foremost electrical experts outside the Commissioners have criticized the scheme in the most destructive way, the Institution of Electrical Engineers have sent their protest, the President (Mr. R. A. Chattock) has condemned it, and now the Incorporated Municipal Electrical Association have expressed their disapproval in no uncertain terms. In a resolution the members have declared their belief that, in its present form, the Bill "will not attain the object for which it is being promoted—viz., cheaper electricity to the consumers, which is a forerunner to its more widespread use. The proposals of the Bill are too cumbersome, as well as costly and unworkable; and the Association consider that before any legislation is proceeded with, representatives appointed by the electricity supply industry should be consulted, and given an opportunity of submitting proposals as to the most satisfactory manner of effecting any desired improvement. The Association further is of opinion that the figures in, and conclusions of, the Weir report are open to serious doubt, and also deprecate the suppression of the Merz report, and the undue haste with which the Government has pressed the scheme." Seeing that the Bill is in Standing Committee, this resolution comes rather late; but the Government cannot avoid realizing that there is a great mass of opinion in the electricity industry against their scheme, while support for it is of a very attenuated order. This being so, the scheme becomes more and more something of a compulsory nature; and where compulsion is inflicted in this way, such a scheme cannot hope to realize its objective. What the Government think of it all, we cannot tell; but they must see that there is something wrong somewhere when their proposals meet with such general condemnation outside political circles.

Independent Power Plants.

The general strike and the Government electricity scheme have combined to draw attention again to the question of the adoption of independent power plants by industrial and large commercial establishments. The subject has not been revived in the electrical papers, but in other journals devoted to industry. Not a few industrial establishments suffered a shut-down during the general strike; and now it is admitted in the electricity industry that the Government scheme is not likely to result in a reduction of the charges for industrial power, but will probably cause an overall increase, through the expense of transmitting current to less profitable areas. Furthermore, the greater the concentration of generation, and the longer the exposed transmission cables, the bigger the risks of breakdown and of trouble in the time of labour disputes or war. The independent power plant, where electricity is preferred, is a protection to any industrial establishment. In a letter by Mr. W. C. Mountain, of Newcastle-on-Tyne (published in the "Iron and Coal Trades Review"), he puts two questions: Will the new legislation interfere with independent power plants? Will it cause such a reduction in the cost of purchased power that independent power plants will be rendered obsolete? The reply to the first question is in the negative; to the second, that it depends on circumstances. In industrial areas where low prices for electrical energy already prevail, the electrical requirements of the manufacturer (or other large consumer) must be the deciding factor, except perhaps in cases where there is exhaust or surplus steam or waste heat available for generation—then there can be no doubt as to which is the preferable plan. There electricity can be generated for all purposes at a very moderate rate, although it has to be remembered that there are power demands which are not best met by the electric drive. Regarding the super-power station, many popular misconceptions are current. It is true the fuel consumption is lower than in a station of small size; but the steam consumption of a 10,000 or 15,000-KW. set is only about 10 p.ct. better than that of a 2000-KW. set, and the modern tendency is for this difference to diminish. The capital cost per kilowatt of a super-station is often higher than that of a medium-sized plant, due (as Mr. Mountain points out) to a number of causes, such as the difficulty of providing the immense quantities of cooling water required, the costly nature of the switchgear, and protective devices needed where such large amounts of power are concentrated. Then there is the loss of 15 p.ct. or more of the energy generated in transmission, and that in transformation. No less than 40 to 70 p.ct. of the consumers' bills is expended on interest, depreciation, and maintenance of the distribution system. The super-power station is not by any means of super order in all respects. Hence many industrial and trading concerns find it more economical to have their own independent plants, which are also more trustworthy.

Labour Councils and Electricity Supply.

The electricity industry is cogitating over the experiences during the general strike when labour councils utilized electricity undertakings under their control for political purposes by ordering the cutting-off of the service, and threatening dismissal to anyone who opposed their ruling. They seem to have overlooked the fact that, by so doing, they laid themselves open to litigation for damages for stoppage of supply. Daniel Frankel is a member of the Stepney Borough Council, and also Chairman of the Stepney Trades Council; and, during the recent strike, he sent to Israel Kossoff from the "Stepney Council of Action" a letter stating that their attention had been drawn to a trade dispute between him and his workmen, and, unless there was an immediate settlement, the Council would be compelled to consider the recommendation of a withdrawal of electric light and power, so far as his premises were concerned. This threat was described as unlawfully committing an act calculated to injure or to prevent the proper use or working of Mr. Kossoff's shop and bakery. Daniel Frankel has now cause for meditating over the stupidity of indulging in unlawful acts even in the name of the "Stepney Council of Action." At the Thames Police Court, he was fined £25, and ordered to pay £5 5s. costs for his attempt to act superior to the law.

Narrow-Mindedness.

It is time the Hastings Corporation became a little more broad-minded, and remembered, in coming to decisions, that the Hastings and St. Leonard's Gas Company is a public servant just as much as—if not more so than—the electricity undertaking. Moreover, the Gas Company rendered service to Hastings long before electricity was cabled through its streets; and the gas supply helped to build-up the popularity of the town. But now, to an outside observer, there are members of the Corporation who appear disposed to treat the Company as though, with municipal trading in electricity, they had no right to exist. Several instances which have pointed to this view have from time to time been referred to in our pages. The Corporation have been busy constructing the White Rock Pavilion; and some time ago, as pointed out in these columns, there was a disposition to decline to have gas in the place. Mr. Chas. F. Botley, the Engineer and Manager of the Company, on their behalf offered to pipe the Pavilion free, as it was unthinkable that a public institution of that kind should not have available a supply of gas in the event of its being required. There seems to be no reason why the Corporation should not take such an offer; but the Improvements Committee (probably urged to do so by the Electricity Committee) were dead against the present being accepted. Why? We cannot suggest an answer other than that the Electricity Committee do not wish for even the presence of their formidable rival for such purposes as heating and cooking. The matter has not yet been settled. It was before the Council again at their meeting last Friday week, when the Improvements Committee recommended that the Town Clerk should write to the Gas Company to the effect that the Corporation were "unable" to accept the offer. Again, why "unable?" We cannot trace the slightest inability to do so, if they are willing. There was a discussion; and some members considered that for safety's sake gas, as well as electricity, should be installed, and that this would afford greater security to the lighting of the building, as well as give caterers the choice of gas or electricity for their operations. In the end, the amendment to refer the matter back to

the Committee was passed; and now perhaps prudence will show ascendency over deeply rooted prejudice and hostility, which ought to be absent from municipal government, but which unfortunately appears to be cultivated by trading in electricity.

Oil Fuel and Electricity Supply.

The restrictions which have been imposed on the consumption of solid fuels, and the request that consumers of gas and electricity shall exercise the utmost economy, do not apply to the fortunate customers of the Brompton and Kensington Electricity Supply Company, Ltd. That concern generates electricity exclusively by oil fuel; and, therefore, the restriction in consumption as required by the Government Order does not apply to the Company's consumers, as is the case where coal is used for steam-raising. There are, of course, many smaller electricity stations which are operated by oil-engines; and they, like the Brompton and Kensington Company, have a free hand in the service they can render in these days of unpleasant happenings.

"Safety" Items.

Curiosity led a little boy of eight years of age to be electrocuted at Paisley on the 1st inst. He crawled under a tarpaulin erected over a trench in the roadway, and there touched a live cable which caused instantaneous death. Where such danger exists—if known—obviously something more than a tarpaulin should be provided for protection. Boys will be inquisitive. On the last Saturday in May, there was an outbreak of fire at Chevin Grange, Otley. The occupant of the residence noticing a smell of burning made investigation, and discovered that the contents of the sewing-room were in flames, and that an electric-iron had been left on the ironing-table without being switched-off. Electric irons appear to possess an excellent potentiality for starting fires. Towards the end of April, All Saints Church, at Penarth, near Cardiff, was destroyed by fire; the damage being estimated at £10,000. It is reported that the outbreak originated in the organ loft, and was "probably" caused by the fusing of an electric wire.

GOVERNMENT INTERFERENCE WITH ELECTRICITY SUPPLY IN NORWAY.

A Sorry Tale—Increased Rates and Taxes.

The leading commercial paper of Norway is the "Norwegian Mercantile and Shipping Gazette;" and it is a publication which has always been favourable to electricity, and, in the past few years, has contained articles which have not been altogether friendly to gas. It is therefore the more remarkable that, in the issue for April 28, an article appears criticizing Government interference with the supply of electricity. There are lessons in it for this country, in view of our own Government setting to work to reform the electricity industry. It will be seen that the effect of such interference in Norway has been to inflict injury on the industry and the electricity consumers, and to impose additional burdens upon the taxpayers—in other words, the result is an "economic calamity." Mr. John Irminger, the Managing Director of the Bergen Gas-Works, has kindly translated the article for us; and we are sure it will prove interesting to our readers, in view of the position of electrical affairs in this country.

[Translation.]

During the first few years of existence—beginning with about 1890—the supply of electricity in Norway was developed by private enterprise; and it was consequently administered according to sound business principles. Later on, electricity works were built by municipalities and subsequently by rural districts; and these were managed pretty well in the same manner as would be private concerns.

However, the question of laws governing concessions arose, and at the same time the Government commenced to acquire waterfalls. In this direction the Government have spent considerable sums—almost 8 million kroner. At the present time the capital is yielding no return whatever. To a large extent, the reason for the purchases was to enable the Government to regulate the prices of waterfalls, and thus have control over the economies of the supply of electricity throughout the country. The acquired water rights are distributed practically all over the country.

A further development was that various municipalities combined to form intercommunal power companies for the production and distribution of electricity. In this connection, "Norges Industri" points to the unfortunate occurrence of the Government having interfered in the question of supplying electricity. This is now realized in many places in Norway. An example of strong criticism was recently noticed in the reports of a meeting of the County Council in Sor-Trondelag, where it is now appreciated that the supply of electricity is a matter which cannot be suitably carried on under County Council administration. A Special Committee have recommended that the county should sell the purchased water rights, and dissolve the Council electricity office.

Economic Side of the Supply of Electricity.

The reason why the Department for Water Rights and Electricity was originally created was, of course, that through it the supply of electricity in the whole country should be shaped according to one plan, with the view to obtain the best supply in the cheapest possible manner. It is to be regretted that in practice expectations have not materialized. The county supplies developed very rapidly. Independent of public control, and neglecting sound economy and technical co-operation with existing electric plants, construction of large new power stations was commenced. Thus in practice no real national plan has been realized. The power plants which had been commenced had to be finished. It was soon found that these plants would be much more expensive than had been estimated; and it furthermore appeared that in planning them sufficient weight had not been placed on the fact that electricity supply should be a business in which the payments for the current sold should be able to meet all the obligations of the concern. During the war it became desirable to supply every home with electricity; and thus the supply, instead of being a question of economy, became purely a social one. In order that everybody should be able to obtain electric current, definite areas of distribution were decided upon, to coincide as far as possible with the counties.

The Great Mistake and the Issue.

County electricity works were an error of judgment. It is these county works which have led to the great economic calamity which has overtaken several of the counties. Economic and sound progress in the distribution of electricity is hindered by mixing together questions which have little relationship. Of the debt of the counties in 1925, more than 163 million kroner was due to the electricity works alone. One has now got so far that, instead of every house and farm having electric light, the deficit caused by the electricity supply has to be paid by rates and taxes. In Aust-Agder the debt has now reached 531 kroner per inhabitant; while in counties which are not mixed-up in the electricity calamity, the debt is at its highest 20 to 30 kroner per inhabitant. At times, the burden of debt has been so heavy that the Government has had to grant emergency loans to save parishes and counties from disaster.

In some places a controversy has arisen between the various parishes and the county, inasmuch as the parish is able to buy power cheaper from other sources than from the county electricity works. Due, however, to the monopoly given to the counties by law and by the Municipal Corporation Act, the county authorities force through their own selfish schemes irrespective of economic considerations, and ignoring the rights and interests of the municipalities.

As a result of the laws of concession (which latterly have been made use of in a very harsh manner), the supply of electricity by private enterprise has almost entirely stopped. This has been very harmful to the country. It would be ridiculous if developments should take place which would give to the counties (without, from a technical point of view, any justification) the sole right to produce and supply electric current. A monopoly of power supply for large areas on any other than a purely technical basis has no justification; and the economic consequences of such a policy have already been shown.

Lack of Responsibility and Judgment.

When a close investigation is made of the manner in which the county supplies have been managed, one soon finds that millions could have been saved for the country if one had solely aimed at providing the best and the cheapest scheme for the general distribution of electricity. It is not easy to escape the fact that, in many cases, large plants have been designed with an utter lack of responsibility and judgment; and this will continue if the counties are to carry on the supply of electricity. This not only applies to the persons associated with the management, but also to the county councils themselves, in which representatives from thinly populated areas are able to obtain a majority in voting for decisions which are of interest to those areas, but are inexcusable from the point of view of the economy of the electricity works and of the county. Another reason for the state which has been reached is that several of the leading engineers have more knowledge of construction than of the distribution of electricity, combined with which is the recklessness which (to a certain extent) has occurred in carrying through immature schemes.

The great advantage which Norway has in cheap water

power ought not to be ruined by administration so bad that none of the inhabitants receive any benefit therefrom. If due consideration is not paid to the fact that the population is very thin, Norway will have—despite its natural advantages—more expensive current than many other countries. This is a very good reason for pulling-up, for realizing the absurdity of what is proceeding, and for making use of the experiences in the country before the war, and of those of foreign countries. It will be understood that the supply of electricity has got on to a wrong track; and when during the war Norway commenced the policy which has since been carried out, one did not contemplate that there would be deficits from electricity which would have to be paid by rates and taxes.

It has been a very expensive experience for the rate and tax payers to be led into these speculations, which have proved a great misfortune for our country.

QUESTION OF FLUE REQUIREMENTS IN HOUSING SCHEMES.

By ARTHUR FORSHAW, M.Sc., Chief Chemist to R. & A. Main, Ltd., Falkirk.

The gas industry and the gas appliance industry are to-day being faced with a very serious state of affairs in connection with new house property. This arises primarily from the attempt of some architects and builders to reduce the price of the finished house. Unfortunately, the means adopted towards this end are open to grave objection from several points of view; and the writer's aim here is to bring the matter to the notice of the industry generally, not only so that those to whom it is a new thing may be forewarned, but also that counsel may be taken as to concerted steps that are necessary to avert the danger and its consequences. Unless this is done, we shall, with our usual British slackness, awake to find ourselves presented with a *fait accompli* that cannot be altered without an inordinate effort. To put it briefly, the attempt to reduce building costs is taking the form of providing rooms or offices with inadequate flues or, what is worse, with no flues whatever.

Our industry has had such a firm grounding in the necessity for providing adequate ventilation in bedrooms, living rooms, offices, and factories during the last twelve or fifteen years, that this attempted new development in building practice comes as a great shock. It is apt to make us feel momentarily "nonplussed." It seems barely credible to us that architects and builders, particularly the former, should take such grave risks to health for the sake of saving a few pounds. In one case, for instance, two bedrooms were being built without flues in order to save, according to the builder, between £4 and £5 *per house*.

Our first action, on being confronted with a case of this sort, is naturally to ask what is the state of the law, and, further, who is responsible for passing the plans of new property, and what are his duties and obligation in the matter. So far as Scotland is concerned, the Statute governing the matter appears to be the Burgh Police (Scotland) Act of 1892; and this provides for means of ventilation approved of by the town council. In practice this is interpreted as meaning a sufficiently opening window. It is further laid down that every habitable room shall have at least one window of an area of one-tenth of the area of the room, one-half of the window to be made to open full width; and, further, that any habitable room of less than 100 sq. ft. of floor area, and without a fireplace, shall be provided with special means of ventilation to be determined by the town council. This is usually met by making an opening in the wall communicating with the external air; the area of the opening being generally a nominal 9 in. by 9 in.

It will be seen that in Scotland—and no doubt the English provisions are on much the same lines—if a room is greater than 100 sq. ft. and is provided with a window as laid down, no fireplace or flue of any sort is required by law. In a room smaller than this, any form of air-brick or grating leading either to the open air or to a cavity wall may satisfy the local town council. Thus, so far as statutory requirements go, there is no obligation on architects or builders to provide a flue capable of being used with a fire, either coal or gas, whether the room be great or small.

The result of this is that, unless immediate steps are taken to get fresh legislation or to alter the interpretation by town councils of the existing Act, new property will inevitably be built without flues, and the use of gas for fires and the like will be automatically prevented. The matter is particularly urgent, since it is understood that at the present moment the London County Council have the London Building Act under review, with the intention of bringing forward shortly an amended Bill.

There is another result which must be briefly mentioned. It is that, as rooms must be warmed at some time or another, the only possible means—by which is meant, of course, the only one which does not incidentally give actual gaseous products of combustion—is electrical; and in the case of the bedrooms already alluded to, the builder justified his omission of flues by saying that he could instal electric heaters *which required no flues*. Ideas of this sort, which are no doubt held in good faith, are very dangerous; and for their origin and acceptance it is unfortunate that electrical propaganda cannot be held blameless. The average builder could hardly be expected to be an expert in hygiene; and so long as he complies with the law as interpreted by the local authorities, no doubt he considers himself free to accept the statements of an industry—such as the electrical one—which to him is presumably staffed by technical men whose business it is to be acquainted with the various outside sciences in which the satisfactory use of their appliances involves them. Where the builder's acceptance at the same time accords with his desire to save costs, it must be obvious that counter propaganda will have to be very strong and authoritative to affect him. In fact, it cannot do so without the backing of fresh legislation or the conversion of the local authorities to a realization of the underlying hygienic facts. Until he gets this pressure applied to him, he will continue to build rooms without flues, and so compel the occupiers to risk their health—and not only that, but to confine their choice of heating appliances to electrical ones.

With regard to architects, we naturally expect from them a better informed and more exact appreciation of the needs of the tenants in the matter of ventilation; but while no doubt this is true of the majority, yet unfortunately the expectation is in a number of cases hardly justified, and it is these latter who are the cause of the trouble under discussion. When these architects are not bemused by the spell of the word "electricity," they seem to have very little knowledge of the requirements of gas-consuming appliances or of the hygienics of ventilation. Thus two cases have been met with in the last week or so where 3-in. flue pipe has been specified. It is only fair to say that one of these was due, not to an architect, but to the engineer to the town council concerned; and on representations being made to him, he altered his decision. There must be many cases of this sort which do not come to notice until it is too late for alterations to be made to the plans. This is all the more reason for now ensuring that such cases cannot recur.

It is not the intention in an article of this sort to go fully into palliatives or remedies; and it is recognized that the cost of building must be reduced whenever it is possible. General mention must, however, be made of the various patented or proprietary hollow blocks which are designed to take the place of brick chimney flues. The use of these undoubtedly reduces the cost of building; but discussions with architects and builders and others interested lead to the opinion that the present price of these devices is much too high to give the required relief. It has been suggested that such blocks could be made locally very cheaply from gas-works waste products, thus saving both proprietorial royalties and carriage. In contemplating such procedure, it is very necessary that a general scheme should be drawn up for the guidance of the local makers, so that uniformity and adequacy in the size of block should be ensured. In drawing up such a scheme, the co-operation of representatives of the architectural profession and of the building trade must necessarily be sought; otherwise confusion is bound to follow, and the benefits looked for will be more or less lost.

The first step in the matter appears to be for us to make up our minds as to the minimum sizes of flue channels that will satisfactorily meet the requirements of all the types of room likely to be encountered. In this connection, it is necessary to mention again here, as the writer has done on other occasions, that the function of a flue is two-fold—viz., the effective removal of all the products of combustion of the appliance to be used, and, secondly, the removal of a quantity of extra air. From the point of view which we have to meet—that of reducing building costs—it seems to the writer that these two functions had better be considered separately. A comparatively small and inexpensive flue channel is sufficient to deal effectively with the removal of the products of combustion, provided it be properly attached; whereas if the channel has to be made large enough to deal with a large amount of extra air, it will become too expensive. The secondary function can, in fact, probably be more cheaply fulfilled by an entirely separate arrangement—such, for instance, as a ventilating grating and shaft in the upper part of the room, or at any rate some similar device independent of the window.

Enough has been written to outline the danger with which we are faced and the problem we have to solve unless we wish to be cut-off from an important outlet for gas as a fuel. The size of coal fire flues is already compulsory under existing Acts; and with this precedent there appears to be good hope that similar legislation could be initiated for dealing with gas fires. We must, however, be in a position authoritatively to recommend for the purpose the necessary shafts; and before we can do so, inquiries must be made as to permissible dimensions, materials, condensation and its effects, and similar details, and the results collated and their bearing determined by a representative body.

SAFETY OF APPLIANCES FROM PRODUCING CARBON MONOXIDE.

"A Method for Testing Gas Appliances to Determine their Safety from Producing Carbon Monoxide" is the title of Technologic Paper No. 304, by E. R. Weaver, J. H. Eiseman, and G. B. Shawn, published by the U.S. Bureau of Standards. In this the causes which result in the liberation of carbon monoxide from appliances are briefly discussed, together with the character of the tests applied to determine the relative safety of different apparatus in use. It is shown that all types of appliances commonly employed—fires, cookers, and water heaters—can readily be made safe from the carbon monoxide hazard, but that there is no certain way, except a laboratory test, by which even an experienced person may judge whether an appliance is or is not operating safely.

It is pointed out at the beginning of the report that the appliances which cause minor effects of carbon monoxide poisoning—such as slight periodic headaches—cannot be regarded as defective or antiquated, nor are they operated under abnormal conditions. On the contrary, many of them are modern, recently installed, and normally adjusted. The statement is then made that there is for every apparatus a maximum, and for some appliances a minimum, quantity of gas which can be burned completely, and therefore safely, and that this quantity varies with the pressure and composition of the gas supply and the adjustment of the appliance.

So far as the Bureau is informed, no manufacturer of appliances has any accurate way of determining the limiting conditions of gas supply under which each of his models will operate satisfactorily, and no consumer has any way of assuring himself that his appliance is adapted to his service conditions. Only a few of the larger companies have any method of determining what apparatus can be used safely under the conditions which they maintain; and even these have no means of controlling the sale by other agencies of unsuitable appliances within their territory. The only way of remedying this situation, it is suggested, is to determine in a systematic manner the conditions of gas supply for which every appliance offered for sale is suitable; to provide the manufacturer with a list of the territories in which such conditions prevail; and to furnish each gas company with a list of the appliances suitable for use under its local conditions. It is further remarked that a great service will be rendered to the public if it is possible so to designate an appliance that the purchaser will know at once that a competent authority has determined its suitability. Probably this would force out of the market those appliances which do not meet the requirements. Readers will appreciate the desirability of putting this ideal into practice when it is mentioned that in the United States there are about 2000 public utility companies supplying manufactured and natural gas. The heating value of the gas supplied varies from 340 to 1400 B.Th.U. per c.ft., and pressures at the consumers' appliances differ from 0·5 in. to 50 in. In England the calorific power of the gas supplied varies from 250 to 560 B.Th.U. per c.ft., but the vast majority of the undertakings supply between 450 and 500 B.Th.U. But in this country also it is necessary to make sure that the appliances fixed are suitable for the local conditions.

CAUSES OF CARBON-MONOXIDE PRODUCTION.

The liberation of carbon monoxide by gas appliances may be classified under three headings: (i.) That caused by accidents over which the manufacturer has no control; (ii.) that produced by conditions which are noticeably wrong, and are generally corrected or made the subject of complaint by the user; and (iii.) that produced by apparatus which to the untrained observer appear to be operating normally. The third is, of course, the principal cause of trouble, and the most difficult to eliminate. It includes appliances in which the flame is stable, and which do not deposit carbon, but in which combustion is nevertheless incomplete. The burning of gas is a chemical reaction which will take place only at high temperatures; and if access of air to the flame is so restricted that the quantity of oxygen which mixes with the gas stream before it is cooled below the reacting temperature is insufficient to combine with all of the gas, combustion is incomplete and carbon monoxide is produced.

When secondary air is considered, three causes of failure to meet the requirements for complete combustion may be distinguished. The draught through an appliance is not great enough to supply the necessary amount of oxygen. The total amount of secondary air may be adequate, but its distribution and direction of flow, and the arrangement of burner ports, are such that some of the flames do not receive their proper share. Finally, the secondary air may be sufficient and well distributed, but the combustion space is too small to permit complete combustion before the gases are cooled below the reacting temperature. Primary air is much more effective than secondary air in ensuring complete combustion, and provision for the former is therefore one of the most important characteristics of any design.

TESTS MADE.

The paper deals only with tests which show under what conditions combustion is satisfactory from the standpoint of safety, and does not include any consideration of efficiency or other requirements for a good appliance. It is also limited to a single gas—carburetted water gas of a calorific value of 600 B.Th.U. per c.ft.

It is stated that a determination of the satisfactory operating range of any appliance (with a gas of definite composition) requires a knowledge, for each gas rate, of the amount of primary air which will (i.) permit the complete combustion of the gas, (ii.) prevent deposition of carbon by a yellow flame, (iii.) cause the flame to flash back into the mixing tube, or (iv.) cause the flames to blow away from the ports. These facts may be represented on a single diagram, the co-ordinates of which correspond to the amount of gas burned and the amount of air injected On the same diagram may be represented the effect of each change of the adjustments of orifice, pressure, and air regulator. Such a diagram, it is stated, gives a great deal of information to the designer.

The investigators employed electrical apparatus to determine both the air-gas ratio and the amounts of carbon monoxide and carbon dioxide in the products of combustion. "Forced" and "normal" tests were carried out—the former to determine the limits of operation of the appliance; the latter those made with the apparatus operating as it would in actual practice. A comparison of the results of these two groups of tests shows whether the appliance will work satisfactorily. With regard to the forced tests, the appliance to be tested is connected to supplies of gas and air, which can be varied at will, and the air is forced into the injecting tube under pressure. A sampling tube from the burner head to the air-gas ratio apparatus provides means for determining the proportion of air and gas for every setting; and another similar tube conveys a sample of the products of combustion, from a hood above the appliance, to the carbon monoxide and carbon dioxide apparatus.

RESULTS.

The results of the investigation are embodied in eighteen diagrams constructed in the manner previously described. Eight of these relate to gas fires, six to ovens and hotplates, and four to water heaters. Emphasis is laid on the importance of selecting an orifice of correct size for each appliance and each gas supply. If too large an orifice, an excessive amount of gas is delivered, and the liberation of carbon monoxide results. If too small an orifice is employed, the supply of gas will not be sufficient to do the desired work, and, because the air-gas ratio increases as the size of the orifice is decreased, trouble from back-firing may be encountered. Mention is made of the fact that one of the best heaters, as far as combustion was concerned, had a burner cheaply built of light sheet metal of doubtful strength and durability; one of the worst was strongly built of the best materials and beautifully machined throughout. Even such important single characteristics as primary air injection give little indication of safety. Four appliances which produced carbon monoxide under normal operation introduced more primary air than a heater which could not be made to produce carbon monoxide even under forced tests.

One of the graphs relates to an oven in which combustion was incomplete at low gas rates only. A baffle was placed directly over the burners, and was so close that the flames impinged against it. When the gas was low, the amount of heat conducted away by this baffle cooled the gas below the reacting temperature before combustion was complete. When the gas rate was increased above a definite figure, the amount of heat lost to the baffle did not affect the temperature of the gases sufficiently to prevent their complete reaction. The supply of secondary air was also materially increased at the higher rates, by increased thermal convection. The graph shows that the oven could probably be made satisfactory at all rates by increasing the distance between the burners and the baffle. Another diagram is of an oven which produced considerable quantities of carbon monoxide at all useful gas rates. In this case a ring burner of unusual design gave perfect combustion until the pressure above the burner became higher than that below, and the flow through the open centre of the ring was downward instead of upward. The diagrams are most instructive, and the report as a whole is valuable. It is published by the Government Printing Office, Washington.

Before terminating this note, mention may be made of the fact that plans have been prepared for the co-operation of the American Gas Association, the Natural Gas Association of America, and the Government Bureaux, with the result that an appliance testing laboratory is now being established at Cleveland, Ohio, by the American Gas Association. This laboratory is intended to serve both the natural gas and the manufactured gas industries; and to the U.S. Bureau of Standards has been assigned the responsibility for the basic researches necessary on the utilization of gas.

Waverley Association of Gas Managers.—The Association will meet in Messrs. Ferguson & Forrester's Restaurant, 129, Princes Street, Edinburgh, on June 25. The President (Mr. Laurence Farquhar, of Peebles) will take the chair at 11 a.m., and will deliver an address which will be open for discussion. Owing to the coal strike, the Committee have decided not to have the usual excursion.

OIL FROM COAL.

By HARALD NIELSEN.

"The future prosperity of this Empire is intimately bound up with the scientific utilization of its fuel resources."

An almost impenetrable secrecy surrounds the various processes for producing oils from coal. There are a vast number of workers in this particular field, and only every now and then is a small corner of the veil lifted and some few facts and figures made available. Even these generally appear in a form which will not allow any satisfactory conclusions to be drawn one way or the other.

For years past the writer has again and again attempted to make clear to industrial England the urgent and vital importance of attacking the research problem of oil from coal, and to invite scientific co-operation in every possible form on this stupendous subject, for only by concerted efforts can light be thrown on the coal-oil mechanism.

In a general way, there are at present three methods of producing oil from coal—namely:

1. Distillation at low temperatures—up to (say) 550° C.
2. Hydrogenation (berginization, after Bergius).
3. A mixture of 1 and 2—that is to say, distillation of the raw coal followed by the production of CO and H_2 from the solid residue, and combination of the two gases over a catalyst to form hydrocarbons (Franz Fischer, Hans Tropsch, and the Badische process).

Let us marshal a few facts—*i.e.*, those that can be taken on incontestable evidence to be true facts.

The first thing which confronts the investigator is the deplorable lack of system in the fundamental examination of oil, or, in other words, the discrimination between oils and tars—when is an oil an oil and not a tar.

Prof. Fischer in his excellent work "Die Umwandlung der Kohle in Ole" has indicated methods. Of these he, at the time his book went into print, spoke somewhat modestly, but nevertheless his indications are well worth following, for, as far as present knowledge goes, they are the only methods by which concordant results can be obtained. In the writer's opinion, Fischer's examination methods deserve much more publicity than can be gained by being bottled-up in a text book and limited to the edition of same.

The oily products obtained by the straight distillation or carbonizing of coal can be divided up into three main groups:

(*a*) Purely primary products.
(*b*) A mixture of primary and secondary products.
(*c*) Purely secondary products.

Taking these groups one by one, we find that the primary products may be produced (*a*) by subjecting the coal to a hot current of gas—that is, distilling by means of an inert gaseous heating medium of such volume that all the heat necessary for the distillation is carried as sensible heat in the gas. External heating may also be employed, provided a large enough volume of gas or steam is continually sweeping through the retort. As examples of the two systems may be mentioned the "L & N" retort and the modified Stinnes retort.

(*b*) A mixture of primary and secondary products is obtained when any externally heated retort system is used, where no sweeping gas is employed, or when internal heat is used and the oil products are condensing on the raw coal, being continuously re-evaporated as the coal proceeds onwards. For example, the externally heated Thyssen retort, and the internally heated Lurgi and Maclaurin retorts, or vertical gas-works retorts run under steaming conditions.

(*c*) Secondary products are the order of the day in present coke oven and horizontal gas-works practice.

There is a fourth way of obtaining oil products from coal—namely, that of extraction by means of suitable solvents under either heat or pressure, or both combined.

Particularly, Prof. W. Bone in his excellent paper before the Society of Chemical Industry (June 19, 1925, Vol. XLIV., No. 25) gives some highly interesting data regarding the extraction by benzene under pressure at 260° to 285° C. and 35 to 45 atms.

A particular coal seam, the Barnsley Bed seam, for which Prof. Bone's figures are available, is one on which the writer and his assistant and collaborator, Dr. Baker, have done a considerable amount of work.

Table I. gives the analysis of this coal, together with that of a very similar Silician coal on which independent research on Bergius oil obtained from the latter has been carried out by Myron Heyn and Manfred Dunkel, of the Silician Coal Research Institute. It is, therefore, possible to correlate results without any grave errors, and to draw sundry conclusions which may be of some assistance in elucidating the constitution of coal.

Investigators agree upon the vital importance of obtaining the so-called primary products—that is to say, oil products recovered with little or no secondary decomposition. Once the right and sure primary foundation is there, the erection of the subsequent structure is much simplified. It was not until recently that a method of identification was worked out by Fischer and his collaborators referred to above. The method is based upon the observation that original primary products which have been subjected to thermal decomposition are, on subsequent distillation, far more easily decomposed, and alter in their behaviour towards petrol-ether; in other words, once soluble in petrol-ether, they become on subsequent distillation only soluble to a degree. Besides this, a marked increase in specific gravity is noted. If the Fischer test is employed, the older naphthalene test, which is not always to be relied upon, can be dispensed with.

TABLE I.—*Analysis of Raw Bituminous Coal.*

—	"L & N" Process.	Bergius Process.
Origin of raw coal	Barnsley Bed seam	Lower Silician
Proximate analysis on ash and moisture free basis (a.m.f.b.)—		
Volatile matter	36·85 p.ct.	34·62 p.ct.
Fixed carbon	63·15 ,,	65·38 ,,
Ultimate analysis on a.m.f.b.—		
Carbon	84·78 ,,	83·85 ,,
Hydrogen	5·12 ,,	5·37 ,,
Oxygen	7·49 ,,	10·78 ,,
Nitrogen	1·45 ,,	
Sulphur	1·16 ,,	
Ratio C : H	16·55	15·60
Coking power	Medium	Slightly coking
Nature of raw coal	Unwashed duff	Unwashed duff

Fischer advocates the following procedure:

200 c.c. of crude oil is shaken up with 300 c.c. of petrol-ether (boiling point 30° to 65° C.). After 30 minutes, the ether solution is decanted from the thick precipitate, and placed in a large separating funnel. 200 c.c. of 20 p.ct. caustic soda solution is added, and the whole is well shaken. After separation, the soda phenolates are run out. This soda treatment is repeated, separation is again effected, and the resultant neutral ether solution is washed with 200 c.c. of water. After the separation of the wash water, the petrol-ether is evaporated from the solution on a water bath. The residue is stripped in a 150-c.c. Engler flask placed on an asbestos plate up to 200° C. The stripped oil is now poured into a 100-c.c. Engler flask and distilled up to 300° C. by a naked, soft flame. The specific gravity of the fraction 200° to 300° C. is ascertained and corrected for 20° C., as well as the specific gravity of the residue above 300° C.—this latter, however, at 50° C. Futhermore, the ether solubility of the residue above 300° C. is examined.

Fischer, from a number of elaborate tests comes to the conclusion that a primary oil must, according to this test, show the following properties:

Fraction 200° to 300° C. : D^{20} below 0·95
Above 300° C. : D^{50} below 1·00
Solubility of residue in cold petrol-ether: Complete.

He gives the following results:

TABLE II. (A).

—	Specific Gravity, D^{20} 200° to 300° C.	Specific Gravity, D^{50} Residue above 300° C.	Ether Solubility.
True primary oil	0·9100	0·9850	Complete
Vertical retort tar (comparison)	0·9850	1·0931	Leaves large percentage residue

TABLE II. (B).—*Process of Distillation, "L & N."*

No.	Kind of Coal.	Specific Gravity, D^{20} 200° to 300° C.	Specific Gravity, D^{50} above 300° C.	Petrol-Ether Solubility of Residue above 300° C.
1	Fifeshire (Townhill) non-coking coals	0·9065	0·9750	Complete
2	Yorkshire (Garforth) non-coking coals	0·9015	0·9780	Complete
3	Yorkshire (Barnsley Bed) coking	0·9115	0·9700	Complete
4	Yorkshire (Barnsley) non-coking	0·9045	0·9700	Complete
5	Durham (Lambton) coking	0·9045	0·9800	Complete
6	Yorkshire (Doncaster) non-coking	0·9015	0·9770	Complete
7	Durham (Seaham) coking	0·9115	0·9770	Complete

The remarkable difference between the primary oil and the vertical tar is at once evident.

TABLE II. (C).—*Process of Distillation: Externally Heated Horizontal Steel Retorts* (560° C.).

No.	Kind of Coal.	Specific Gravity, D^{20} 200° to 300° C.	Specific Gravity, D^{20} above 300° C.	Petrol-Ether Solubility of Residue above 300° C.
8	Same as No. 2, Table II. (B) .	0·9445	1·036	Very poor, large percentage of insoluble

TABLE II. (D).—*Process of Distillation: 'L & N."*

No.	Kind of Coal.	Specific Gravity, D^{20} 200° to 300° C.	Specific Gravity, D^{20} above 300° C.	Petrol-Ether Solubility of Residue above 300° C.
9	Same as No. 7, Table II. (B) .	0·9200	0·9950	Complete

Table II. (B) gives a whole series of Fischer tests carried out by the writer and his assistants on primary oils obtained from a wide variety of coals by the " L & N " process of distillation by means of internally applied heat in rotary retorts.

For the purpose of comparison, the Fischer test on one of the coals, No. 2, Table II. (B), and on oils obtained by an externally heated retort at 560° C., is given in Table II. (C).

We have observed that by pre-treating the coal to be distilled by a gas containing oxygen at temperatures at which the coal substance is heated to round 200° C. an increase in density of the neutral oils takes place without, however, interfering with the petrol-ether solubility. Table II. (D) gives particulars of coal No. 7, Table II. (B), which has been pretreated or oxidized, in order to lower the coking power, by passing an otherwise inert gas through and over the coal, the gas containing 8 p.ct. of free oxygen.

From Table II. (B) emanates the highly interesting fact that, provided they are primary products in the correct sense of the word, and have been obtained under the proper conditions and strict temperature control, all the neutral oils from bituminous coals are identical, irrespective of district, coking and non-coking, younger or older formation. The first observation which led to these more extended investigations was the remarkable similarity in the various distillation curves, which were plotted in each case, relating to percentages by weight against boiling-points.

The striking similarity of the ultimate analyses of the 200° to 300° C. Fischer analyses from several of the above-mentioned coals speaks for itself.

TABLE II. (E).

Coal.	P.Ct. Carbon.	P.Ct. Hydrogen.
Barnsley Bed (No. 3)	86·89	10·72
Doncaster District (No. 6).	86·77	10·97
Lambton (No. 5)	86·55	10·65
Townhill (No. 1)	86·66	10·65

This work confirms Prof. Bone's observations (see above) in which he says: " Its (the benzene extract) ultimate composition varies very little from coal to coal." Consequently one may say with confidence that the true primary oil products obtained from very varying grades of bituminous coals are identical not only in composition, but also in specific gravity, relative percentage by weight of fractions, and physical properties.

The importance of these observations cannot be over-rated, because they make it clear that by suitable treatment a uniform crude oil can be obtained from the various bituminous coals in this country; and this opens out the possibility of producing standard oils throughout, the oils being amenable to the same refining treatment and miscible in all proportions.

A series of investigations on primary oils from brown coals and lignites is at present being conducted by us in order to correlate primary oils from these with those from bituminous coals.

In view of the above, the opinions expressed by Messrs. Sinnatt and King, of H.M. Fuel Research Board, in their paper " A Study of the Tars and Oils obtained from Coal," read before the Society of Chemical Industry in July, 1925—

> The properties of a tar can still vary, given a constant carbonizing temperature, with the retorting system, and even in the same system fairly wide variations are possible which are *entirely due to the nature of the coal treated,*

must be discounted. Since the coal substance is not and cannot be at fault, the *retorting system must be.*

It is easy to understand how Messrs. Sinnatt and King came to their conclusions. They evidently employed a retorting system which permitted secondary reactions and cracking of the primary products, however carefully worked. Hence the oil on which they conducted their researches was not true low-temperature oil, but a mixture of primary and secondary products, as pointed out by the writer in the subsequent discussion on their paper. Observe the oil No. 2, Table II. (B), and compare same with the observation 8 in Table II. (C). The coal employed in each case is identical; the distillation methods are different. In fact, there is a far wider difference in constitution between these two oils obtained from the same coal than there is between oil 2 and the rest, obtained by the " L & N " process. It is, therefore, clear that the fault is the retorting system.

Furthermore, the wide discrepancy between the assay results mentioned in Sinnatt and King's paper and their large-scale test—as much as 40 to 60 p.ct.—clearly shows that there is no agreement whatsoever between the two, and that the oils obtained by the one method cannot possibly serve as any sort of guidance for the other. This is unfortunately the case whenever external heat is employed for distillation. When internal heat is used, the story is quite different. We have here, by the " L & N " assay method, agreement with large-scale tests varying between 95, 98, and 100 p.ct., because the distilling medium, time, temperature gradient, &c., are identical in both cases, and thus concordant results are obtained.

Dr. Reinhardt Thiessen, of the U.S. Bureau of Mines, in his lecture on the microstructure of coal before the Royal Society of Arts on March 10, 1926, said:

> All of the constituents (of coal) may be easily traced through all the ranks of coal, from brown coals to anthracites, *and in all of these are alike,* constituent for constituent.

Hence it is not to be wondered at that the true primary products are alike. This we consider we have further proved by our work; and the writer firmly believes that the key to the solution of the constitution of coal is close examination of the primary products. This is why we have consistently advocated research on true, primary products first and foremost.

(*To be continued.*)

ILLUMINATION RESEARCH.

The Department of Scientific and Industrial Research have issued a pamphlet which gives to those interested in the problems of illumination information regarding the present objects and scope of the work of the Illuminating Research Committee, which they appointed in July, 1923. The terms of reference to the Committee were:

(*a*) To consider and advise on requests from other Departments for investigations in connection with the lighting of buildings and allied problems; and to supervise such investigations, if approved by the Advisory Council.

(*b*) To co-operate with the Medical Research Council by making arrangements for and supervising physical investigations needed in connection with physiological researches on illumination.

(*c*) To examine the need for general researches on illumination, to make such recommendations to the Advisory Council as they may consider desirable, and to undertake the supervision of approved investigations.

The members of the Committee are: Mr. C. C. Paterson, O.B.E. (Chairman), Mr. L. Gaster, Mr. H. Hartridge, M.D., Sc.D., F.R.S., Mr. L. B. W. Jolley, Mr. J. A. MacIntyre, O.B.E., M.Inst.C.E., Sir J. Herbert Parsons, C.B.E., D.Sc., F.R.S., F.R.C.S., Mr. A. Alban H. Scott, M.S.A., Mr. J. S. G. Thomas, D.Sc., Mr. J. W. T. Walsh, M.A., M.Sc., A.M.I.E.E., and Mr. D. R. Wilson.

It will be observed that Dr. Thomas (whose work in connection with the Research Department of the South Metropolitan Gas Company is well known to the gas industry) is a member of the Committee.

In an introduction to the programme of the work of the Committee, it is pointed out that the attainment of successful illumination is contingent on the fulfilment of a series of conditions. At one end is the physical problem of furnishing light as economically and efficiently as possible; at the other end, the effect of the light utilized on the human eye, by which the suitability of any lighting installation is ultimately assessed. Hence it is evident that not only the engineer and the physicist, but the ophthalmologist, the physiologist, and the psychologist, must contribute to the solution of lighting problems. Credit is given to the Illuminating Engineering Society for the primary attempt in this country to secure this co-ordination. The first official action dealing with illumination was taken in 1913, when, following some preliminary investigation carried out by the Factory Department of the Home Office, a Depart-

mental Committee were appointed to inquire into the lighting of factories and workshops. In 1917, a temporary committee to deal with illumination were appointed by the Department of Scientific and Industrial Research, and occupied themselves until their dissolution with various problems requiring immediate solution—notably investigations into the possibility of maintaining home supplies of efficient illuminating glassware. In 1921, the National Physical Laboratory was approached by H.M. Office of Works with a request for guidance as to the illumination desirable for general office work. Meanwhile, the Home Office Committee on Factory Lighting had issued three reports, which emphasized the complexity of the problems involved in industrial lighting, and the call for further research. The need for an authoritative body to initiate and undertake more comprehensive investigation into these problems became increasingly apparent. Hence the appointment of the present Committee in 1923. The Committee have established close relations with the Committee on Physiology of Vision appointed by the Medical Research Council; and arrangements have been made for linking-up the work of both Committees—thus co-ordinating the physiological investigations with those of a physical nature. The results of the investigations will be embodied in reports, of which the following are at present in course of publication: (*a*) "Definition and Explanation of the Terminology of Illumination and Vision;" (*b*) "The Transmission Factor of Commercial Window Glasses" (A. K. Taylor and C. J. W. Grieveson); (*c*) "Study of the Relation between Illumination and Efficiency in Fine Work" (H. C. Weston); (*d*) "The Light Distribution from Industrial Reflector Fitting No. 1—British Engineering Standard" (H. Buckley and C. J. W. Grieveson).

Architecture and Engineering.

An account follows of some of the main problems with which the Committee are at present concerned under the above heading. They are: (1) The transmission of light by various kinds of window glass (*e.g.*, clear plate, Hartley's rolled, prismatic, fluted, &c.). (2) The effect of window size and of the colour and reflection factor of walls and ceilings on the daylight illumination of deep rooms, particularly in positions remote from the windows. (3) The effect of prismatic glass in deep rooms. (4) The design of picture galleries, so as to give adequate illumination with a minimum of glare due to reflections in the glazing. (5) The effect of the position of the light sources in certain widely-used enamelled steel reflectors for industrial lighting. (6) The relation between glare and visibility in street lighting. (7) Temperature distribution in the glass and other parts of lighting fittings.

Regarding 5, 6, and 7, we quote as follows from the pamphlet:

5. *The Effect of the Position of the Light Source in certain widely-used Enamelled Steel Reflectors for Industrial Lighting.*—The desirability of effectively screening the light source so as to eliminate glare has been emphasized in the reports of the Home Office Department Committee on Lighting in Factories and Workshops. This investigation is concerned mainly with the problem of standardizing reflectors used for industrial lighting, so as to encourage the production of fittings which are substantially free from the drawback of "glare" or "dazzle." This object may best be secured by ensuring that the bright source of light is situated well within the reflector, so that in all ordinary positions it is screened from the view of the operative. Suggestions arising from a number of tests have been incorporated in the British Standard Specification for "Industrial Reflector Fittings for Electric Lighting." Details of the investigation will shortly be published.

6. *The Relation between Glare and Visibility in Street Lighting.*—In view of the growing volume of motor traffic, and the large number of street accidents during recent years, increasing attention is now being paid to the provision of adequate public lighting. In many busy streets, the maintenance of a higher order of illumination is probably desirable; but it is at least equally important that the illumination should be furnished without undue glare from the powerful street lamps now used. A bright light, falling within the direct range of vision of the driver of a motor vehicle, may have a temporary dazzling effect; and it is probable that even moderately bright sources, seen obliquely, to some extent impair the visibility of objects in the streets. The problem of providing uniform illumination along the length of the street, and at the same time completely avoiding glare, is a somewhat difficult one. The investigation proposed to be undertaken is designed to study the effects of glare and arrangements of the light sources in relation to the visibility of objects on the roadway, and to prescribe conditions which would limit, as far as possible, the drawback of glare from street-lighting installations.

7. *Temperature Distribution in the Glass and Other Parts of Lighting Fittings.*—In the design of modern lighting fittings, especially those in which powerful lamps are used, distribution of temperature plays an important part. In the case of electric lamps, concentration of heat in certain parts may be responsible for early failure of the leading-in wires; similarly uniform distribution of heat is a factor in determining the life of globes and chimneys of a "heat-resisting" character. All such problems are now of more consequence than in the past in view of the continual increase in candle-power of modern light-sources, usually accompanied by the generation of a large amount of heat. Design must provide for the conduction or radiation of excessive heat, and the study of these conditions is an essential preliminary to standardization.

Physical and Physiological.

As already mentioned, in the study of many problems which are partly physiological in their nature, the Committee are receiving the active co-operation of the Medical Research Council, who have also set up a Committee on the Physiology of Vision. Four members of the latter Committee, including the Chairman, are members of the Illuminating Research Committee, so that ample opportunities are afforded for the exchange of information and suggestions. Among various problems of a primarily physiological nature which have been referred by the Illumination Research Committee to the Medical Research Council Committee may be mentioned: (8) Investigation of the phenomena of glare. (9) The effect of flicker on vision. (10) The effect of illumination on the ease and accuracy with which fine work can be carried out. On these points the pamphlet states:

8. *Investigation of Phenomena of Glare.*—While it is a well-known fact that the exposure of the eye to a very bright object (such as the beam of a motor-car headlight, or a powerful unshaded source of artificial light) causes "dazzle" or "glare," in the absence of any certain test by which it can be determined whether or not a lighting installation is glaring, and liable to cause eye fatigue or injury, such recommendations for the avoidance of glare as have so far been made are mainly empirical. They are based on general experience, and form a useful indication of the precautions expedient to minimize the unpleasant effects of glare. Glare, however, is determined by many different factors, the actual brightness of the object viewed, its contrast with surroundings, its distance from the eye, and the angle which a line from the eye to the source of light makes with the line of vision, &c. Until all these factors have been fully explored, and the physiological nature of glare is understood, it is impossible to frame scientifically-derived rules for its avoidance. This investigation is necessarily a lengthy one, but, if successful, it should lead to results of fundamental importance in illuminating engineering practice.

9. *The Effect of Flicker on Vision.*—This problem likewise deserves detailed physiological investigation. The irritating effect of a flickering source of light is recognized; but there is need at present for a definite test by which it can be ascertained if the fluctuation in intensity of light is such as to cause fatigue or inconvenience to vision. The problem has arisen in practice in connection with the use of metal filament lamps on an alternating current of low frequency. The customary frequency is 50 cycles per second; but in some districts a frequency of 25 cycles per second is used, and effects in this case require special attention. It is also a question of evident importance in connection with the effect on the eye of long-continued viewing of cinematograph films.

10. *The Effect of Illumination on the Ease and Accuracy with which Fine Work can be carried out.*—This is a good example of a problem which is partly physiological and partly physical in scope. While the response of the eye to higher illuminations is mainly a matter for the study of the physiologist, any such investigation must clearly be combined with physical tests, such as measurements of the amount and distribution of the illumination provided. In addition, the co-operaton of persons thoroughly familiar with the industrial process studied is desirable. At the present time, there is a widespread belief that inadequate illumination, by imposing handicaps on the worker, and destroying the sense of confidence and security on which efficient work depends, is detrimental to expeditious and accurate performance. Few authoritative data on this subject are as yet available, though the question is obviously one of great importance in industry.

Physical.

Concerning the physical section of the inquiry, it consists mainly in the study of methods of measurement or the accumulation of statistical data. The problems being dealt with are: (11) The design and construction of instruments for the measurement of daylight illumination in buildings. (12) The determination of the average brightness of the sky at various times throughout the year. (13) Measurement of mean spherical candle power. Regarding 13, the pamphlet says:

13. *Measurement of Mean Spherical Candle Power.*—In addition to the above work, most of which is in active progress, a report has been drawn up by the staff of the Photometry Department of the National Physical Laboratory on methods of measurement of mean spherical candle-power by means of photometric integrators of the Ulbricht sphere type. This report will be published in due course. In view of the growing recognition that sources of light should be compared in terms of the average candle-power in all directions, and not on the basis of candle-power in one direction only (which might be liable to give rise to misunderstanding in view of the widely different character of modern sources of light as regards its distribution), it is hoped that this report will serve a useful purpose as a guide to measurements of this kind.

Bureau of Standards Publications.—We have received communications from the Bureau of Standards (the Department of Commerce, Washington) regarding the publication of the Technologic Papers No. 303 on the "Causes of Some Accidents from Gas Appliances" and No. 304 on "A Method of Testing Gas Appliances to Determine their Safety from Producing Carbon Monoxide." Regarding No. 303, the price of this is 30 c. per copy, and that of No. 304 10 c. The Bureau particularly ask that remittances should not be sent to them, but should be addressed to the Superintendent of Documents, Government Printing Office, Washington, from whom copies (at the prices named) can be obtained.

INTERNATIONAL CONFERENCE ON NITROGEN PROPAGANDA.

(*Concluded from p. 523.*)

DETERMINATION OF PRICE AND CREATION OF NEW FORMS OF NITROGEN FERTILIZERS AS FACTORS IN PROPAGANDA.

By F. C. O. SPEYER, B.A. (Oxon), General Manager, British Sulphate of Ammonia Federation, Ltd.

The paper by Dr. Bueb, to which we have just listened with such pleasure, is, I think, the most impressive statement which has been published in regard to the nitrogen problem since the memorable prophecy made by Sir William Crookes over a quarter of a century ago. The facts set out by Dr. Bueb are at one and the same time the justification of Crookes' fears and the realization of his hopes; their recital in this paper—a model of brevity and lucidity—has a twofold significance for us, for it tells us not only what has been achieved by the Stickstoff-Syndikat, the largest producers of nitrogen in the world, but also the policy and method underlying what they have accomplished.

As to the achievement itself—the solution of the problem of making atmospheric nitrogen available for agriculture and industry—I believe that this will rank in history as one of the great milestones in the progress of human endeavour, and that the names of those responsible for it—one of whom, Dr. Bosch, we are pleased and honoured to have among us to-day—will be remembered with gratitude by mankind.

As regards the means by which the Stickstoff-Syndikat has brought home to the world in general, and to farmers in particular, the potential wealth which lies in each kilo of nitrogen, I think we shall all agree that a low price and adaptable variety of form are the two most potent instruments of propaganda which we possess.

It is often said that the actual level of price for nitrogen has little effect on consumption, provided that it is firmly maintained and that there is a reasonable expectation that the increase in the yield of the crop will pay for the nitrogen applied. This I believe to be a fallacy, whether regarded from a psychological or from an economic point of view.

On the psychological side, there is much ignorance and prejudice still to be overcome. An apophthegm of a great French writer not inaptly, I think, describes the spirit in which the propagandist is, all too recurrently, met by the farmer: "La question est de savoir si, après tout, les insanités consacrées par le temps ne constituent pas le placement le plus sage qu'un homme puisse faire de sa bêtise." Which I may prosaically translate: "What was good enough for my father is good enough for me." This attitude is encouraged, perhaps some would say justified, by the inability of agricultural science at present to give a definite answer to a specific question.

There are thousands of chemists who could, to-day and in front of us, make an exhaustive analysis of any soil we put before them, and tell us exactly in what plant foods it was deficient. And yet not one of those chemists could honestly give a guarantee to the farmer of the land represented by that sod, that, if he supplied the deficiency, he could with certainty rely upon getting the desired increase in crop. The honest chemist would say: "Such and such plant foods are present in this soil, but I cannot tell you if they are available to the crop. If they are present in sufficient quantity and the conditions of climate and rainfall are satisfactory, you may get a favourable result, but on the other hand you may not." In order to induce the farmer to put the matter to the at present indispensable test of practical experiment, there must be offered to him the widest possible margin between the maximum gain he can hope to obtain in yield and the maximum loss he must expect in outlay if the experiment fails. Moreover, as Dr. Bueb has pointed out, the only argument which the propagandist can use validly and effectively with the farmer is the economic one: "It pays."

We are to hear later to-day what steps agricultural chemists are taking to make it possible for them to answer the farmer's doubts and questions with less ambiguity. The progress along the path from ambiguity to certainty will be the measure of the reduction possible in the margin for failure to be allowed in the price. Until agricultural chemists have solved their fundamental problems, nitrogen producers will have to bear the brunt of the sacrifice in price now rendered imperative by their ignorance.

In pursuing this line of thought, I have become involved in the exposition of that part of the economic argument which may be summarized thus: The price for nitrogen (and other fertilizers) must be sufficiently low to allow the farmer an ample margin for failure, partial or total. This may be called the relative economic argument; but there is also an absolute consideration—namely, the fact that to-day's level of price for nitrogen is too high to enable it to be profitably used on any but a small proportion of the world's crops. It is true that the crops which generally show a profitable return for nitrogen at present prices are the great staple crops, the cereals, sugar-beet and roots, potatoes, cotton, tea, and rubber, though even in the case of some of these it does not pay to use nitrogen in certain countries. But in addition to these staples of commerce there is a wide range of crops, including most of the grassland in the world, the millets and the fodder crops, which might be consumers of fixed nitrogen if the price were lower. Here, then, provided soil and climate are suitable for crops capable of absorbing increased quantities of nitrogen, lies a land of promise stretched out before the propagandist, the entry into which is by the straight and narrow path of a lower price. It may, therefore, be laid down with confidence that each successive reduction in the price of nitrogen will be followed by an increase in demand—relative in regard to those crops to which nitrogen is now being applied; to some, though not to the maximum possible, extent absolute in the case of those crops on which it is unprofitable to apply nitrogen at the present level of price. This progress will continue until the scientists of a future generation have succeeded in making the essential foods required by the human body by direct synthesis, thus cutting out the long series of links in the present chain which begins with the plant seed and passes through all the stages of vegetable and animal growth until the essential conditions for human existence have been provided.

I am not going to take up much of your time by commenting on the purport of the second part of Dr. Bueb's paper. His proposition that you can only obtain the maximum possible consumption of nitrogen by providing the necessary variety of forms of nitrogen, suitable for the different types of plant, soil, and climate, is incontrovertible and now, indeed, self-evident. But I would like to emphasize the fact that the credit for making this a self-evident proposition to us, here and now, belongs very largely to Dr. Bueb and his colleague Dr. Bosch.

The list of new nitrogen compounds which they have made available for agriculture, as shown in Dr. Bueb's paper, is eloquent testimony to the progress already achieved and to the never-resting spirit of enterprise and investigation which continues to animate them. That the principle of the desirability of diversity, within the limits of uniformity, has found practical acceptance by the leading producers' organizations in this Continent is evinced by the fact that our old friends the Comptoir Français du Sulfate d'Ammoniaque have now become the Comptoir Français de l'Azote; that the Verkoopkantoor in Holland and the Belgian Comptoir have distributed nitrogen products other than sulphate of ammonia; and last, but by no means least, that the Società Montecatini—the latest organization to enter the lists of producers of synthetic nitrogen on a large scale—also make and sell various forms of nitrogen.

Even in conservative England we are moving in the same direction, and an arrangement has been made with the Stickstoff-Syndikat whereby such of their new nitrogen products as are likely to suit British conditions will be made available for British farmers. We hope that this arrangement will mean a considerable increase in the use of nitrogen for grassland in England. But though these new forms of nitrogen, especially those combined with phosphoric acid and potash, are doubtless destined to play an important part in promoting a general increase in the use of nitrogen, there seems room for considerable further expansion in the use of the well-known forms, such as ammonium sulphate. It is therefore of interest to try to ascertain exactly for how much the price factor has counted in particular instances.

During the eight years preceding the war, the prices of ammonium sulphate were on an average lower than the parity of prices for Chile nitrate in the British home market, and in one or two years the difference was very largely in favour of sulphate. It was certainly profitable for the farmer to use nitrogen for many crops at these pre-war prices for nitrogen, and it was therefore to be expected that whenever the one form of nitrogen was markedly cheaper than the other, a corresponding alteration in the consumption of each would take place.

In spite of the fact that fairly efficient propaganda work was done for ammonium sulphate, practically no movement of this kind was observable, and the pre-war consumption of ammonium sulphate in Great Britain remained at 40,000 to 60,000 tons, while about 80,000 tons of nitrate were used. It needed the overwhelming stimulus of the margin between war prices for agricultural produce and pre-war prices for ammonium sulphate to bring about a real increase in consumption. And it is significant to note that, while the consumption in the United Kingdom rose for agricultural purposes alone to a maximum of 269,000 tons in 1918-19, at prices which had by that time risen to slightly over pre-war level, no less than 233,000 tons of ammonium sulphate were still used in 1919-20 at about £22 per ton. After the unfortunate boom years 1920-21, prices were reduced to £15 to £16 per ton; but this reduction was not sufficient to stem the tide of disillusionment caused by the fall in price of agricultural products, which was leading farmers to revert to grassland. Accordingly, we find the consumption for

1921-22 reduced to 136,000 tons. Since then prices for ammonium sulphate have been continuously lower, at a level ranging from about £15 to £12 per ton, and consumption has again slowly risen to about 160,000 tons. The British consumption of Chile nitrate has meanwhile fallen from 80,000 to 40,000 tons per annum.

There were, of course, numerous other factors at work which influenced the consumption, but I think we shall not be seriously wrong if we conclude from the above facts and figures that it needs something more than an ordinary advantage in price to bring about a change-over from one form of nitrogen to another on the part of the consumer; and further, that once an initial price sufficiently attractive to bring about the change has been maintained for some time, it can be increased largely provided the effective margin of profit to the farmer remains large, but that as soon as a rapid fall in the value of agricultural produce takes place, a simultaneous reduction in the price of nitrogen is not of itself sufficient to arrest the tendency to "economize" by not using nitrogen. The moral for nitrogen producers seems to be that the temptation to raise prices because of any temporary increase in agricultural prosperity must be resisted.

These truths are now being realized in France, owing to much the same circumstances which Dr. Bueb has described as prevailing in Germany. A few years ago France was only consuming 2·60 lbs. of pure nitrogen per acre of arable land, compared with 4·53 lbs. for the United Kingdom and 10·3 lbs. for Germany.

To-day's figures are approximately:

—	Arable Acreage in Millions of Acres.	Consumption of Pure Nitrogen.	
		Lbs. per Acre.	Total per Annum in Tons.
Germany	67	11·2	335,000
France	54	4·5	108,000
United Kingdom	14	5·6	35,000

Owing to the special conditions prevailing in Belgium, Denmark, and Holland, the consumption of nitrogen per acre in those countries is very much higher, being from twice to three times the German average.

It has required overwhelming economic pressure to raise the consumption of nitrogen in Germany and France (and to a lesser extent in England) to its present level, because these countries were able before the war to count on their exportable surplus of manufactured goods to provide them with foodstuffs which could be grown more cheaply in countries on the periphery of the economic world.

The question therefore arises whether the increase in the output of nitrogen in Germany, France, England, and the rest of Europe to a point at which it is possible to provide countries on the economic periphery with relatively cheap supplies of nitrogen, will not ultimately produce a reaction unfavourable to home consumption in the producing countries. If the figures given in the extremely interesting and comprehensive Nitrogen Survey published by the United States Department of Commerce a few years ago can be considered as typical for other great countries which are only now commencing to consume nitrogen on a large scale, there is little doubt about the answer to this question.

The conclusion reached in the Nitrogen Survey is that at the present rate of increase in population in the United States, the present capacity for producing fixed nitrogen, together with the normal increase which may be expected from bye-product sources, will be hopelessly inadequate to meet that country's needs towards the end of the present decade. Increase in population means cessation of extensive cultivation, and therefore ultimately creates a demand for nitrogen. If this proposition is true for conditions in the United States in ten years' time, it is even more true—certainly of British India, probably also of China—to-day. In British India you have a population of 320 millions, which has increased at the rate of 100 millions in the last 50 years. Large portions of India are more thickly populated than Belgium. The constant wars on the northern frontiers are due largely to the fact that the barren hill country cannot provide sufficient food for the increasing numbers of hillmen. In the plains the factor which 50 to 100 years ago kept the population in check was an appallingly high rate of mortality. Even in 1918-19 the great influenza epidemic killed no fewer than 7 million human beings in India. But better provision by the Government against actual famine and the inculcation of more hygienic methods of living are counteracting and decreasing the death rate, so that there is a steadily increasing demand for food and clothing. This demand can only be satisfied by fertilizers, and the brief experience gained so far points to the fact that nitrogen is the element which is lacking over large portions of that vast country.

Up to now comprehensive experiments have only been made on tea gardens, and field experiments in regard to the effect of nitrogen on other crops were practically non-existent up to a year ago. We are now endeavouring to make good this deficiency; and the fact that the consumption of ammonium sulphate has risen from about 6000 to 20,000 tons per annum during the last eighteen months shows that a useful beginning has been made.

Here, again, the price factor is of great importance, though it appears in a different form, for in India, as in China, over 90 p.ct. of the farmers are smallholders. Owing, among other conditions, to the peculiar social customs which often lead heads of families to mortgage their labour for many years in advance in order to provide dowries for their children or funeral expenses for their relations—land being to a large extent inalienable—cash payments are practically never made. Indeed, a whole chain of merchants, middlemen, and money-lenders is at present interposed between the producer and the consumer, so that the price to the latter is often 100 p.ct. above the price received by the producer. It is obvious that the consumer is

TABLE I.

All the figures in Table I. are expressed as tons of 2240 lbs. of pure nitrogen.	Estimated Total Consumption of Nitrogen for Agricultural Purposes only, in Tons of 2240 lbs. of Pure Nitrogen (in the form of Chilean Nitrate of Soda, Ammonium Sulphate, Calcium Nitrate, Cyanamide, Urea, &c.).		Estimated Total Production for Agricultural Purposes, in Tons of 2240 lbs. of Pure Nitrogen, of Ammonium Sulphate only.		Estimated Total Consumption for Agricultural Purposes, in Tons of 2240 lbs. of Pure Nitrogen, of Ammonium Sulphate only.	
	Fertilizer Year.		Fertilizer Year.			
	1913–14.	1923–24.	1923–24.	1924–25.	1923–24.	1924–25.
Group 1.—Germany, United Kingdom, France, Belgium, Holland, Scandinavia, North Russia, Poland, Czecho-Slovakia, and Switzerland	385,475	545,470	384,785	423,530	319,123	334,678
Group 2.—Countries bordering the Mediterranean other than those in Group 1	53,120	66,870	7,175	7,790	28,567	43,755
Group 3.—Indian Empire, Philippines, Straits, Dutch East Indies, Siam, Japan, and China	43,240	94,045	26,035	33,190	90,753	92,806
Group 4.—Africa and neighbouring islands (excluding Egypt)	1,545	1,700	205	205	1,486	1,502
Group 5.—United States, Canada, Central and South America, West Indian Islands, Cuba, and Hawaii. . . .	111,695	147,290	85,587	95,940	62,880	88,052
Group 6.—Australia and New Zealand	250	2,150	3,095	3,485	2,111	2,462
	595,325	857,525	506,882	564,140	504,920	563,252
Estimated consumption of Chilean nitrate of soda for industrial purposes not included in above	95,750	108,750	..	..	..	..
	1923–24.	1924–25.				
Estimated total production of all bye-product and synthetic forms of nitrogen.	680,000	745,100	..	..	..	..
Estimated deliveries of Chilean nitrate of soda in consuming markets	340,000	363,000	..	..	..	..
	1,020,000	1,108,100	..	..	..	..
Estimated total for agricultural consumption. . . .	857,525	983,100	..	..	..	..

enormously benefited by any reduction in the initial price under these conditions.

I may say that steps are being taken to endeavour to eliminate many of the links in this chain of parasites; but the problem is of such vast dimensions that it is probably only capable of satisfactory solution by a considerable measure of State assistance.

The conditions described above render propaganda work especially difficult, for while in Europe the smallholder can often be easily induced to make experiments, because he can afford to pay for the relatively small quantity of fertilizer required for his little plot, in India you have to commence propaganda for nitrogen with the village money-lender, for he it is who decides whether the ryot is to receive the necessary credit.

These examples seem to indicate that, at any rate during the next few decades, every increase in population will surely call forth an additional demand for nitrogen, and that as regards countries on the economic periphery, the standard of living in those which are thickly populated is at present so low that any increase in their own output of agricultural produce will result in an improvement of that standard rather than in an exportable surplus of produce.

As regards thinly populated countries on the periphery, conditions are not so clearly defined, and increased use of nitrogen, where it is possible, will probably in certain cases lead to increased exports. A case in point is Western Canada, where we are now conducting some preliminary experiments on wheat on a field scale, in order to get information at present unavailable.

It is tempting to try to look still further ahead, and to ask whether the western nations, in sending nitrogen to the east, may not be preparing for themselves that Götterdämmerung which will mean the final extinction of the white race. If that happens, future generations of our race may not be prepared to endorse the estimate of the value of the labours of Dr. Bosch and his coadjutors in other countries, which I ventured to express at the beginning of this paper! But here I am drifting into the realms of imagination—as Huxley once said, how often has the pretty fairy of fancy been killed by the wicked little devil of fact!

TABLE II.—*World Population.*

Population.	Population in Millions at Nearest Census to—		Percentage, Increase (+) or Decrease (−).	Density of Population. Inhabitants per Sq. Km.	Percentage or World Area and World Population, 1924.	
	1913.	1924.	1913=100.	1924.	Area.	Population.
Europe. . . .	467·8	454·7	− 2·8	47·3	7·3	24·5
America, North & Central . . .	133·5	151·9	+ 13·8	6·8	17·0	8·2
America, South .	56·5	65·8	+ 16·5	3·4	14·5	3·5
Asia	987·3	1032·8	+ 4·6	24·6	31·9	55 8
Africa	133·6	139·3	+ 4·2	4·7	22·8	7·5
Australasia . .	7·6	8·6	+ 13·1	1·0	6·5	0·5
Totals. . .	1786·3	1853·1	+ 3·7	87·8	100·0	100·0

TABLE III.—*Prices for Feeding Stuffs, Fertilizers, and Agricultural Produce in England and Wales, Expressed as Index Figures.*

—	Average 1911–13.	1921.	1922.	1923.	1924.	1925.
(A) Feeding Stuffs:						
Barley (imported) .	100	184	132	115	149	144
Oats (imported) . .	100	166	147	135	135	146
Maize	100	181	148	152	167	167
Milling offals . . .	100	179	141	129	150	143
Oil cakes	100	193	157	138	153	150
Brewers' grains . .	100	159	154	132	147	154
Barley meal and maize meal. . .	100	181	138	134	155	153
(B) Fertilizers:						
Sulphate of ammonia	100	133	109	102	96	87
Nitrate of soda .	100	176	139	128	130	123
Basic slag (30 p.ct. total phosphate) .	100	324	195	140	112	116
Superphosphate . .	100	258	157	130	128	123
Kainit	100	198	107	80	88	102
(C) Produce:						
Wheat (British) . .	100	219	146	130	152	160
Barley	100	184	141	119	165	148
Oats	100	172	147	135	138	138
Potatoes	100	232	179	113	257	204
Hay	100	151	140	130	101	101
Vegetables . . .	100	246	196	148	165	167
(D) Milk	100	263	179	174	170	170

Scottish Junior Gas Association (Eastern District).—Owing to irregular train services, as a result of the coal strike, the visits of the Association to Perth and Dunfermline have been cancelled.

LAMBERT RECORDING DEMAND FLOWMETER.

As the outcome of a request by the Demand Meter Committee of the American Gas Association for an instrument which will meet the requirements laid down in their recommendations for a device with which to record continuously the gas demand by an industrial consumer, the Lambert Meter Company are marketing a type of apparatus designed to indicate and record continuously and instantaneously the quantity of gas flowing through it. At present the Company are making the instruments (which can be installed anywhere in the gas supply line) with capacities up to 20,000 c.ft. an hour.

The meter consists, according to a description of it which has appeared in the pages of the "American Gas Journal," of two concentric tubes, the inner one having a vertical slot; and inside this inner tube is a float or piston, which moves easily up or down. The gas inlet is part of the inner tube, and the gas outlet part of the outer tube. As the gas enters the inner tube, it raises the float; and as the float moves upwards, it exposes part of the vertical slot, thus permitting the gas to pass into the outer annular chamber, and from there through the outlet to its destination. When the hourly consumption increases or decreases, the greater or smaller flow moves the float to a proportionately higher or lower position—exposing more or less of the vertical slot. The meter thus becomes really a variable orifice device with a constant pressure differential.

To the top of the float is connected a simple and positive link movement, which is directly attached to a mechanical chart recorder; and the rise or fall of the float causes the pen of the recorder to move correspondingly backwards or forwards across the chart. The recorder is fitted with a seven-day clock, so as to furnish a record of the flow of gas over this period of time. From this record, one can read directly in cubic feet per hour the gas consumption at any particular time throughout the seven days.

HURDLE BENZOLE SCRUBBERS.

In a paper read before the American Chemical Society last year (parts of which are reproduced in the May, 1926, issue of "Chemical and Metallurgical Engineering"), a description of the process for the recovery and purification of benzole, as practised by the Portland (Oregon) Gas Light and Coke Company was given by Mr. E. L. Hall, the General Superintendent of the Company. Centrifugal scrubbers have been superseded by hurdle scrubbers; and the coal gas is scrubbed after it has passed through the purifiers.

These hurdle scrubbers consist of four steel towers 10 ft. in diameter and 85 ft. high. The shells are connected in series, so that the gas flows from the bottom to the top of each. The scrubbers are filled with wooden grids constructed of ¼ in. by 6 in. boards on edge, with ½ in. spaces between. Each successive layer of grids is laid at right angles to the one below; and the bottom edges of the boards are serrated, to assist in the even distribution of the oil, which is of the utmost importance in obtaining high efficiency. The top of each scrubber is fitted with 36 spray pipes, which distribute the absorption oil evenly over the grids. The gas and oil flow are counter-current. The oil, which is termed benzolized wash oil, then drains by gravity into an underground tank of 12,000 gallons capacity, from which it is pumped to the distillation equipment, where light oil is removed and the debenzolized wash oil returned to the scrubbing system. The scrubbers have an area of 78½ sq. ft., 40 p.ct. of which is taken up by the grids, so that the net area is 47 sq. ft.

At a maximum gas flow of 900,000 c.ft. per hour, this gives a time contact of 49 seconds through the four scrubbers. With an average gas flow of 450,000 c.ft. per hour, the time contact is 98 seconds. These figures are based on the effective height of each scrubber being 65 ft., which is the space occupied by the grids. In order to cut-down the wash oil circulation during the summer months, when the gas output is low, and still maintain high efficiency, the oil piping is so arranged that it is possible to re-circulate a portion of the wash oil over each scrubber. It has been found that with tower scrubbers it is not usually possible to obtain a saturation of the light oil in the absorption oil of more than 3½ to 4 p.ct., and still maintain a high recovery efficiency. It is not possible to attain 100 p.ct. recovery efficiency in actual practice; but an efficiency of 95 to 97 p.ct. may be realized by maintaining the benzole content of the wash oil which last comes in contact with the gas below 0·5 p.ct. It may also be realized by having scrubbers of sufficient number and height to give a time contact of not less than 60 seconds, and circulating sufficient wash oil at a temperature not above 70° Fahr. to cover the entire surface of the grids, and to give a maximum saturation of usually not more than 4 p.ct. (depending on the amount of benzole in the gas) in the absorption oil leaving the bottom of the scrubber through which the gas passes first. The temperature of both oil and gas should be maintained below 70° Fahr. The light oil content of the debenzolized wash oil is governed by the efficiency of the still used for removing the light oil. It should not exceed 0·5 p.ct., and can be kept, with proper equipment, between 0·25 and 0·35 p.ct.

EDUCATION IN INDUSTRY AND COMMERCE.

Conference in Birmingham.

The Eighth Annual Conference of the Association for Education in Industry and Commerce was held in Birmingham on June 9, 10, and 11, and was well attended. The Association originated in a series of conferences arranged by firms carrying on schemes of education among their employees.

The annual report stated that the Association were supporting the inquiry into the relation of technical education to other forms of education and to industry.

Alderman GEORGE CADBURY was elected President; and Mr. D. MILNE WATSON, M.A. (President of the National Gas Council), Vice-President.

Alderman CADBURY presided at the first session, at which the question of "Faculties of Commerce and a Business Career" was discussed.

Mr. GRANT ROBERTSON (Principal of the University of Birmingham) emphasized the importance of a University in an industrial area maintaining the closest contact with, and meeting the needs of, the business community. Modern business required, above all, the trained mind.

Thursday's conference was held at Bournville; and to the delegates the Lord Mayor of Birmingham (Alderman Baver), who spoke highly of the work of the Association, accorded a civic welcome.

In his Presidential Address, Alderman GEORGE CADBURY said that education in industry should be something more than trade or technical; it should be on a broad basis and calculated to bring out the best in a citizen, particularly in relation to public spirit and effort.

Major T. KNOWLES (Boots Pure Drug Company), speaking on co-operation between industry and education, said they were trying to collect from all parts of the country definite information as to efforts which were being made by firms to co-operate with local education authorities.

In the evening of Thursday, an open session was held. At this meeting, Alderman CADBURY presided, the subject taken being "What Education is Doing for Two Leading Industries." The representative industries selected were "Printing and Kindred Trades," on which an address was given by Mr. J. R. RIDDELL, Principal of the London School of Printing; and "The Gas Industry," on which a paper by Mr. F. W. Goodenough was read by Mr. Percy Alden, who paid tribute to the fine social work in London and elsewhere carried out by Mr. Goodenough.

WHAT EDUCATION IS DOING FOR THE GAS INDUSTRY.

By F. W. GOODENOUGH, C.B.E., Chairman, Education Committee of the Institution of Gas Engineers; Vice-Chairman, Advisory Committee, Westminster Technical Institute.

Does the education of employees pay? That, put baldly, is the gist of many queries raised by many employers when they are pressed to give consideration and support to the education of their adolescent and adult employees. What will the firm, the shareholders, the partners, "get out" of it? Can anybody say, not merely as a matter of theory or belief, but from actual practical experience, that money spent on the education of employees is fruitful of profit not only to the employee on whom it is spent, but also to the employer who spends it?

Speaking not merely as Chairman of the Advisory Committee on Education to the Institution of Gas Engineers, but as the head of a department of the Gas Light and Coke Company employing some 5000 officers and men, and having fortunately at its head a man—the Governor, Mr. D. Milne Watson, M.A.—who is an ardent advocate of education of employees, I can answer those questions very definitely in the affirmative, after experience of nearly twenty years of schemes for the education and training of workmen and staff.

EDUCATION A PROFITABLE INVESTMENT.

I am certain, beyond the possibility of a doubt, from my own actual experience and observation during those twenty years, and from the reports made to me by the administrative officers of the department, that money spent on properly devised and efficiently operated schemes for the education of both adolescent and adult employees is a sound and highly remunerative investment—not an "expense" at all, in the generally accepted sense of the word. Money spent on education does not increase costs; it reduces them. It profits him who gives and him who receives. It increases the earnings of the employee, because it increases his value to the employer. Let me be quite definite. It has in fact increased the earnings of employees, because it has in fact increased their value. The Gas Light and Coke Company have increased the maximum rates of pay of certain classes of officers in their service and the annual increments of pay whereby the maximum rates are reached, because they have found they are getting more valuable employees as the result of their improved education and training. They have been able to promote to staff positions of substantial present value and good future prospects a higher proportion of lads entering their service from elementary schools than they could find worthy of promotion before their educational schemes came into operation. They have been able to give much improved service to the community as the result of possessing a better average quality of employee; and they have consolidated their existing business, increased the rate of progress of their business, and improved the future prospects of their business, as a result of the better service they have been enabled to render through the medium of a better educated staff of officers and workmen.

Those are facts within my personal knowledge. They are not speculations or mere probabilities. They are definite results. They are, moreover, confirmed by the experience of other gas undertakings in different parts of the country.

Those are very direct and obvious advantages, alike to the employer and to the employed. There are others, less obvious perhaps, but none the less real, which have accrued in our experience. They are indeed closely related to and in no small degree productive of the direct and obvious advantages of improved and growing business.

There can be no doubt that the employer—whether individual, company, or corporation—who institutes or supports schemes of education for the workers gains in money, as well as in the improved harmony of operation, through having more intelligent people to deal with, and through having employees who take increased pride in the business, who have developed *esprit de corps*, and who feel personal interest in the firm's good name, its progress, and its prosperity, through their increased knowledge and through their appreciation of what has been done for them in the field of education.

APPRECIATION BY THE WORKER.

The British worker is highly responsive to genuine efforts to aid him in his self-development and advancement, to practical evidence of goodwill and co-operation, and, especially, to the knowledge that he can earn promotion through merit, and in no other way. Justice is the quality in the employer that makes the strongest appeal to the employee. An education scheme in connection with any business necessarily implies that in that business close attention is paid to merit; and I know of nothing more productive of profit to the employer than certainty in the minds of the employed that the road to promotion from bottom to top is open to all through merit and merit alone.

Education for vocation almost inevitably carries with it education for leisure; and it is of no small moment to the employer that the greater hours of leisure rightly available today for his employees should be productive of increased intelligence, of wider outlook, and deeper thoughtfulness in the general body of his employees. Wider outlook and truer harmony also come from the meeting together of varying grades of employees for purposes of common study and instruction. Indeed, the "atmosphere" created by the institution of educational schemes supported and encouraged by the employer, and by the co-operation of different ranks in their working—an atmosphere that is reflected in the increased happiness and goodwill of all ranks, and in the hopes for the future of themselves and their children that are aroused in the hearts of all—constitutes an asset of no mean order for the business, and, through the business and through the individuals employed, for the community as a whole.

Again I would say, these are not speculations or deductions from a theoretical consideration of the subject. They are the result of direct personal observation of the actual operation of educational schemes in practice; and they are the opinions which led those responsible for the inauguration by the Institution of Gas Engineers of their scheme for education in the gas industry to put their hand to that task.

Those are, then, some of my reasons for believing that a few notes on the Gas Industry's Education Scheme may be of some interest and value to your Association, especially bearing in mind the fact that it is a national scheme in actual operation, which was evolved and is being evolved as the result of practical testing and experience; and is an integral part of the educational system of the nation, into which it has been worked with immense practical and financial advantage, due to the fact that it makes use of existing machinery and of existing expenditure.

At this point I should add that the results of which I have spoken as having accrued to the Gas Light and Coke Company have been secured as the fruit not only of the industry's national scheme, but of a six-years' apprenticeship scheme which was adopted by the Company in 1909 and has formed the foundation of its educational work. To it has been added recently a staff pupil scheme, from which much good is expected. The moral is that those employers will benefit most

from national schemes who study most closely the needs of their own works and their own employees.

Earlier Work in the Industry.

It should be made clear that the Institution Scheme of 1920 was not the beginning of technical education in the gas industry. That would be to do great injustice to the many undertakings and the many men in the industry who had done all in their power to encourage and foster the education of its employees for many years before this scheme was brought into being, and to the City and Guilds of London, which had been of invaluable assistance to them. The Institution Scheme was rightly described as one for "the *improved* technical and scientific education" of young men in the gas industry. Prior to its establishment, the principal means for encouraging vocational education among employees in the industry was co-operation by the Institution, and by individual gas undertakings, with the City and Guilds of London Institute and local technical education authorities. This took the form of the establishment by the local education authorities of classes in gas fitting, gas supply, and gas engineering, with annual examinations organized by the City and Guilds of London Institute, who issued certificates to successful candidates.

Under the Institution Scheme the co-operation of the City and Guilds of London Institute is still secured in respect of what are termed "minor grouped" courses in gas-works practice and gas supply practice, suitable for the artisan, foreman, clerk, or other employee desirous of improving his knowledge in the industry in which he is engaged, but not having the qualifications or capacity necessary for taking one of the "major" or principal courses under the scheme. Those principal courses are designed mainly to prepare men for the professional sides of the industry, whether engineering or technical-commercial.

The essentially craftsman's subject "gas fitting" provides for the education and training of the mechanics employed in the practical work of the installation and maintenance of gas fittings and appliances. This subject, as formerly, is dealt with by the City and Guilds of London Institute so far as examination is concerned; the classes are held at technical institutes and similar educational centres; and the teachers as well as the examiners are drawn from the industry.

The important differences between the new Institution Scheme and the previously existing arrangements for the education and examination of students in gas engineering and gas supply are:

(1) That the Institution Scheme provides for *courses of study* at approved educational centres for a minimum number of hours over a period of years, in a number of subjects which are fundamental to a proper understanding of the problems of gas engineering and gas supply—such as chemistry, mathematics, physics, building construction, prime movers, drawing, &c.—as a condition precedent to the study of and examination in the main subject; and

(2) That the examinations in those subjects—*i.e.*, gas engineering and gas supply—are conducted by a Board of Examiners appointed by the Council of the Institution; the certificates being issued by the Institution and endorsed by the Board of Education (except in certain cases where, owing to local circumstances, part of the course has consisted of private study instead of attendance at a recognized educational institution).

The Institution Scheme is printed in full in booklets which are in your hands. But for convenience in the forthcoming discussion, I propose to summarize it here. [As our readers are familiar with the main lines of the scheme, we omit the summary.]

At this point I should like to answer in a few words a criticism which is likely to be prompted by the description of the scheme I have just given. It may be said that the use of the existing national education system, and the arrangement whereby the training of employees is carried out partly at technical institutes and not wholly within the industry itself, stamp the scheme as one of mere instruction not entitled to be called a scheme for education. It may be said that the corporate spirit will be lacking, and that this is an example of education not *in* industry, but outside it. My answer would be that the men working under the scheme ordinarily do so in groups, and are in consequence by no means isolated in their work from the atmosphere of their undertaking; that they may and do gain a great deal from associating in their studies not only with each other but with employees of other firms and other scientific industries, so broadening their views; that generally throughout the gas industry the corporate spirit is already strong; and that, above all, the spirit of working for their undertaking and their industry is successfully fostered by the personal interest which the employers and the management do in fact take in the studies of the employees. This last consideration may often compare favourably with the system under which the directors of a firm hand over the whole job to a director of education of their own, and too often take small interest afterwards in the progress of the individual students.

Other Means for Corporate Study.

Further, I should add that within the gas industry there are active organizations for corporate study over and above the Education Scheme. There are Junior Institutions of Gas Engineers, and Circles of Gas Salesmen, organized by districts, which meet regularly to discuss a wide range of subjects affecting their work and the industry at large. These Institutions and Circles, which work without any definite scheme or syllabus and have of course no examinations, have the advantage of the active personal interest of leaders of the industry, who sometimes attend and address their conferences. The costs of travelling are provided by the employers. There is also an Industrial Circle on similar lines for the salesmen specially concerned with the uses of gas for industrial purposes; and there are meetings of the same kind held among the employees of many of the larger individual undertakings. All these arrangements have proved invaluable alike for the exchange of ideas and for the encouragement of enthusiasm and interest.

To return to the Institution Scheme, it will have been observed that the courses I have outlined are definitely technical and scientific in character, and designed principally for the benefit of men engaged on the technical sides of the industry. Both the Higher Grade Certificates and the Diplomas are, in fact, exclusively open to those employed on the practical sides of the industry's work. It must not be supposed that this implies neglect of the education of commercial men. (In passing, it is perhaps necessary to make it clear that I use the term "commercial men" in its widest sense, and not in the sense in which it is sometimes used by educationists, of clerical staff. The latter are of course attached to all branches; gas manufacture, gas supply, and gas sales.) I personally hold the view that the status of the salesman in general requires to be raised in almost every industry; and this, of course, implies the need for a higher standard of education among salesmen; the proper sequence being better qualifications, greater responsibilities, higher rewards.

Service After Sale.

In the gas industry in particular this view is the more inevitable, because of the way in which the industry's problems differ from those of other industries. In most other industries a successful sale of a good product closes the transaction; and it lies largely with the product by the goodness of its quality to bring the repeat order, though of course advertising plays its part of the often necessary reminder. In the gas industry the good product has not only to be sold; much has to be done to ensure that it is properly used after sale. And the salesmen of the industry have the responsibility of seeing, as far as is possible for them, that the customer is continuously using to his own best advantage and complete satisfaction the gas he buys and the appliances he employs.

The gas industry is thoroughly alive to the consequent need for education on the commercial side. But we have also to recognize that for the reason just given the whole nature of the gas salesman's task is semi-technical. The Institution Technical and Scientific Education Scheme is therefore of great value to the commercial men, for whom the gas supply course is principally provided, and it will have been noted that to obtain the Gas Supply Diploma they will have to secure the Ordinary Certificate in gas engineering as well. But even that is not enough; and a supplementary scheme for dealing with the salesmanship side of the industry is under consideration. The Scheme of the Institution, which I have outlined, may seem sufficiently elaborate, but it is in fact only part of a bigger scheme in course of evolution, which will embrace and co-ordinate the sale with the manufacture, distribution, and utilization sides of our complicated business.

The Part of the Universities.

In speaking of "a bigger scheme in course of evolution" I must refer to one vital part of any such scheme which has in the gas industry already been largely developed. A scientific industry has the right to expect assistance from the organized scientific education of universities and the co-operation of these centres in industrial research. True, this should always remain a secondary purpose of our universities, where nothing, let us hope, will be permitted to upset the doctrine of "Education for life before education for any particular vocation in life"—where the humanities, in fact, will always take precedence of science. But there can at the same time be no two opinions as to the value of such a Chair as that of the Livesey Professor of Coal Gas and Fuel Industries at Leeds University.

The establishment and endowment of this Chair were almost wholly due to the inspiration and effort of two great leaders of the gas industry, Sir George Livesey and Sir Corbet Woodall, backed by the keen support of the Institution of Gas Engineers and the industry as a whole. Valuable research work is constantly in progress at the University under the auspices of the Research Committee of the Institution, with the material financial support (and to the material financial advantage) of the industry. I may perhaps quote Prof. Arthur Smithells, late Professor of Chemistry at Leeds, and now Director of Salters' Institute of Industrial Chemistry, who wrote:

> The gas industry has afforded a notable example to the industrial world by its support of organized research, conducted under

the auspices of the Institution of Gas Engineers. At its own instance, unsupported and unhampered by the State, it has shown the way to link-up a great industry with a university in fruitful and harmonious co-operation, without any sacrifice on either side of rights or duties.

Though the University of Leeds has been so closely associated with the technical development of the gas industry and with the training of many of its ablest young engineers and chemists, it is not the only university from which the industry has derived contributions of the kind. At Manchester, at Sheffield, at Birmingham, at the Imperial College, and elsewhere, invaluable work has been done in promoting the scientific interests of the industry and in training the men employed upon its scientific work. All this goes to show the progressive attitude taken by the industry to education, revealed in the fact that by this enterprise men capable of profiting have now a faculty endowed which makes it possible for them to take a science degree in gas engineering and its allied subjects.

Co-operation between Industry and Education.

In other industries, and even in individual firms, the problems naturally differ, and in different ways. Each must develop its own scheme accordingly. In doing so, a study of what is being done in the gas industry may be useful in several directions. At this point there is one matter in particular to which I would draw your close attention. The varying and specialized needs of industry are very present to the minds of many local education authorities and practical teachers; we certainly have derived invaluable and painstaking help from head and assistant teachers to a remarkable degree. Moreover, the machinery exists for making use of this help. Industry can and should avail itself of the facilities of our existing educational system. And yet education and industry often seem out of touch; and employers have frequently been known to say that the educational world cannot think in terms of industrial needs. From this the employer goes on to discard the practical assistance of the facilities at his disposal. He concludes that he has got to tackle his own education problems single-handed. No wonder he often abandons the attempt.

This is not as it should be, nor as it need be. I will not venture to suggest where the fault lies—whether industry or education is to blame. Presumably in some degree both are at fault, seeing they could co-operate without encountering difficulty, and with extensive mutual advantage, but do not. What I would say, however, is that it seems to me proper that a body like the A.E.I.C., representing not education, but industry, yet concerned with the co-operation of the two, should be able to tackle the problem of welding the two into a firm alliance. It shoud not be difficult, as our experience in the gas industry has shown; and it is vitally urgent that the advantages and possibilities of such an alliance should be better understood.

Finance.

Those advantages include the financial. It may be remembered that I began by asking—and answering with an emphatic "Yes"—the question: Does the education of employees pay? I said the expenditure upon it is an investment, not a cost; and I am sure that is true. But I may be asked: Who makes the investment in the first instance in the gas industry—the industry as an organized whole, or the gas undertakings as such, or the employees? The answer is that all contribute some share. The organized industry bears the cost of administration—somewhere in the neighbourhood of £1000 a year is required to cover salary and expenses of the Organizing Secretary, travelling expenses of Committee members, printing, postage, and sundries. The gas undertakings in most cases pay the travelling expenses of students, give them a certain amount of time off, lend books in special cases, refund class fees in consideration of an adequate percentage of attendances, and give monetary rewards for successes achieved. The students provide most of their own textbooks, pay the fees in the first instance, and give largely of their leisure hours.

A substantial proportion of the cost, of course, is borne by the rates and taxes; but as gas undertakings are very large rate and tax payers, they are justly entitled to the fullest possible assistance from both local education authorities and the State, and there is no better way for employers to get value from the large sums they spend in rates and taxes than by establishing national schemes for the education of their employees and securing the active co-operation of the national and local education authorities as the gas industry has done, to its immediate, great, and growing advantage.

The matter, however, cannot be said to end at getting value for expenditure on rates and taxes, important as that point of view may be. There is room also for taking advantage of the existence of polytechnics and kindred institutions, and for full co-operation with them. And, above all, it is in my opinion, and in the gas industry's experience, necessary to the completion of any education scheme, and profitable beyond a doubt, to co-operate with the universities, alike for training and research, especially by the endowment of such Chairs as the Livesey Professorship at Leeds, to which I have made reference above.

Conclusion.

In conclusion, let me repeat my firm belief, based on practical experience for many years, that the education of employees on sound lines, when not merely countenanced but positively encouraged by employers, does definitely stimulate goodwill in industry. It is not merely that the men are made better craftsmen, more efficient tools. It is not even merely that you get men of better character and greater sportsmanship. There is always a great deal of vague talk of "a new spirit" in the industrial world—vague and not very helpful so long as we forget that this new spirit must come not only from the heart, vital though that source of it be, but from the head as well. An intelligent and informed body of workmen would better understand the problems of an industrial age. They would see that grievances existed not to be harboured as grievances but to be removed; and they would know how to set about removing them by approaching employers in the right way, and with the knowledge that these employers cared for the men's advancement and true interests. They would realize the better that management has its difficulties and anxieties and risks, as well as its remuneration and profits; that, indeed, employers often have grievances against the employed which arise out of ignorance and misunderstanding, and which better education would remove or prevent. And, further, they would inevitably come to recognize more and more clearly the true community of interest between employers and employed, understanding of which is vital to industrial stability and progress. It is only in this way that a useful goodwill set upon a sure foundation can arise; and that in the last resort is the best argument—nay, the imperative reason—for education in industry.

Discussion.

Mrs. Cloudesley Brereton described the Educational Scheme of the gas industry as well thought out, in that it met the needs of large numbers engaged at small gas undertakings. In England alone there were 1600 gas concerns, and only a relatively small proportion of them were large undertakings; but the arrangement made was such that all could feel that they were part of a corporate whole.

Mr. Walter Hole, Organizing Secretary for the Institution of Gas Engineers' Educational Scheme, said the summit of the scheme, which he regarded as being of extreme value, was the Diploma. One of the elements in the Diploma Examination was that a student must present a thesis on some aspect of his practical work. This was undoubtedly of great value. The question had been raised as to how technical education could be applied in those circumstances where large classes and schools were absolutely out of the question. The gas industry had solved that problem. The industry was different from other industries in that as a rule there was only one gas-works in one town. Therefore the number of students in such circumstances must necessarily be small. The situation was wholly different in the engineering trade, where the number of students was proportionately higher, and frequently it paid the local education authority to provide classes for the students. But this was not the case either in gas engineering or gas supply. Gas students who were able to attend a course of instruction provided at the local technical institute were told to take chemistry or engineering, or building construction, or physics or cognate subjects; and then, when able to produce evidence of having attained a certain educational standard, they were allowed to sit for an examination in gas engineering or gas supply, taking the necessary further instruction by private coaching or reading, and combining this with practical experience on the works. In this way they had solved to a great extent the difficulty of the isolated student. Regarding a reference to local education authorities and the Board of Education, he had had six years' experience in committee work with members of the Board of Education, and he could assure them that he had found them most sympathetic with regard to the desire of the gas industry to get its young people educated. They had helped them in every way they could; and the same was true very largely of education committees.

The Chairman remarked that the syllabus of the gas industry was of a highly technical character and entirely devoted to gas questions. This was an excellent scheme, but he felt, nevertheless, that it might be developed upon more general considerations, not forgetting the claims of the advantages of citizenship. They could not afford to work in compartments that were too water-tight in these matters.

On Friday, June 11, the topic for discussion was "Technical and Commercial Education in Relation to the Requirements of Industry."

Committee on Dating and Sealing Patents.

The Board of Trade have appointed a Committee, consisting of Mr. J. Whitehead, K.C. (Chairman), Mr. H. A. Gill, M.A., Mr. A. J. Martin, O.B.E., Major-General Sir Philip Nash, K.C.M.G., C.B., and Mr. J. Swinburne, M.Inst.C.E., F.R.S., to inquire into and report whether any, and, if so, what, change is desirable in the practice of the United Kingdom of (*a*) dating and sealing patents applied for under section 91 of the Patents Acts, 1907 and 1919, as of the date of the application in the foreign State; (*b*) dating and sealing other patents as of the date of application, as provided by section 13 of the Acts. The Secretary to the Committee is Mr. B. G. Crewe, the Patent Office, 25, Southampton Buildings, London, W.C. 2, to whom all communications relating to the work of the Committee should be addressed.

COAL BLENDING.

Among the papers presented at the annual meeting of the Iron and Steel Institute, which took place at the Institution of Civil Engineers, Great George Street, Westminster, S.W., on June 3 and 4, was one by Mr. DAVID BROWNLIE, B.Sc. (Hons.), Lond., who gave a review, under the title of "Coal Blending," of general principles as applied to both high-temperature and low-temperature carbonization. Primarily his survey was devoted to the mixing of swelling bituminous coals with other products, such as non-swelling bituminous coals, anthracites and anthracite coals, high-temperature carbonization metallurgical or household gas coke, low-temperature carbonization fuels, oxidized coals, and various constituents of coal. Reference was, however, also made to the use for the same purpose of various other materials, including pitch, oils, and tars, and to the possible application of petroleum and similar natural products.

It was pointed out by Mr. Brownlie that Prof. S. W. Parr (with his associates at the University of Illinois) was the first to prove conclusively, by his investigations commenced in 1902, that, in order to obtain a coherent coke, the original coal must not only contain just the right amount of resinous material, but this constituent must also have a definite melting point—generally about 662° to 842° Fahr.—and the property of not decomposing until at a temperature considerably above the melting point, so that the viscous stage can be retained for some time, thus enabling thorough penetration and mixing to take place. The general method of blending, as developed on scientific lines by Prof. Parr, is of the greatest importance, as it increases very considerably the amount of coal available for the production of a high-grade coke; but in this matter the British coke oven industry (though there are a number of plants in which modern blending is being carried out) is lagging behind both the United States and the Continent.

British coking plants are as a rule so small and scattered that the resulting bulk supplies of coke are not uniform in quality. It would be a much more efficient national policy to divide the colliery districts into areas according to circumstances, have a few very large modern coking plants, blend all the coal received from the many different collieries, and produce a more uniform quality of coke, which probably also would allow the use of about 25 p.ct. of small non-coking coal, at present practically a waste product. As regards low-temperature carbonization, Great Britain is peculiarly well situated for scientific methods of fuel utilization, possessing a large proportion of rich bituminous coal which would give a high yield of bye-products, with the added advantage of relatively short railway journeys. Developments in the treatment of raw coal seem to be tending to the production of a smokeless fuel that possesses extremely reactive chemical properties, and is therefore of particular value for gas producers. In fact, the stage may shortly be reached when it will be the best policy in many cases to subject a great part of the coal to low-temperature carbonization for the specific purpose of power generation by means of gas engines, and to obtain enriched producer gas from the residual fuels, with cracking or hydrogenation of the greater part of the tar oils to light fractions, in preference to using internal combustion heavy-oil engines.

The adoption of suitable carbonization processes with the aid of blending would also be of great value in enabling coke-oven installations to be usefully employed for turning out smokeless free-burning fuel for various markets in slack periods. Further, low-temperature carbonization is becoming increasingly important for the production on the spot of a fuel for blending with any strongly swelling coal. In the Saar, a proportion of the available coals is submitted to low-temperature carbonization; and the resultant smokeless fuel, after the separation of the bye-products, is blended in with the main bulk to give a dense coke.

The paper was of an extensive character, and was divided into eleven sections, one of which made reference to a number of typical low-temperature carbonization processes of special interest to the iron and steel industries, and in which blending in general plays an important part.

Discussion.

Dr. R. LESSING said the paper came at an opportune moment, because there could not be any doubt that the question of blending of coal had not received, in the past, the practical attention which it ought to have done, and which was due to it. The problems associated with coal blending were, in the first instance, questions of geographical situation, because, however desirable it might appear to be to mix, in a suitable manner, coals of different properties, practical and economic and commercial difficulties arose as to how to get the suitable classes of coal together without incurring expenses for transport which were not commensurate with the advantages gained. Nevertheless, he was convinced that, if the properties of various coals were studied from that point of view, and if the minimum quantity of one coal to be added to another was ascertained—in order to produce a certain result—then it would be possible to transport the smaller quantity to the area where the larger quantity existed in a manner which would give commercial and economic results. Mr. Brownlie had referred to the attractive proposal of having large central coking installations in which coal from various sources could be blended in the most suitable manner. Apart, however, from the geographical and purely economical difficulty, there was one other—viz., the actual arrangements for carrying out suitable blending. Coal blending was not a case of just mixing so many tons of one class of coal with so many tons of another by tipping a wagon load of one on to a quantity of the other; the necessary scientific arrangements would have to be made for blending coals in the true sense of the word. This was obviously impossible for any one colliery to do, because it could only contribute one or more of the components required. As a consequence, it seemed desirable and reasonable to arrange for actual blending stations by co-operation between the collieries and the coke ovens, because the plants would have to be of considerable dimensions.

The PRESIDENT (Sir Peter Rylands) asked if coal blending was practised in a practical way in other countries.

Dr. LESSING said it was practised both on the Continent and in America. In the Ruhr especially there was an extraordinary degree of co-operation which enabled this to be done.

Prof. HENRY LOUIS pointed out that this country was not in the same position as Germany as regards coal blending, because Germany had practically one large coalfield, the Ruhr, whereas in this country there were half-a-dozen coalfields producing entirely different coals, and having entirely different markets.

Mr. EDGAR C. EVANS spoke of the technical advantages of coal blending, and referred particularly to gas producer plant in which blended coals had given better results than when the same coals were used separately. Strongly coking coals often gave rise to great difficulties in gas producer working; and therefore it was worth while investigating the possibilities of blended coals or coal blended with coke breeze. It was on the carbonization side, however, that there were the greatest possibilities. The difference in the structure of a coke from a blended coal and from the coal itself was enormous; and blending from this point of view offered most attractive possibilities.

Mr. H. M. RIDGE said the iron and steel industry was vitally interested in the problem of coal blending; and if, and when, low-temperature carbonization was turned into practical politics, and the coke obtained became really usable, then, according to all calculations, coal blending should go a long way towards reducing the price of coke as delivered on the site of a blast furnace plant. Unfortunately the name of low-temperature carbonization was looked upon with great disfavour. In the past there had been a considerable amount of financial jugglery connected with it which had not done any good on the technical side. At the same time, articles had appeared in the lay Press on the subject which boomed low-temperature carbonization products in an unjustifiable manner. He suggested the desirability of arranging for a complete discussion on low-temperature carbonization, combined with ordinary coke-oven practice.

Mr. A. HUTCHINSON remarked that the methods adopted in Germany or America for coal blending would not necessarily give the best possible solution under the conditions in this country. There were other methods of improving coals for carbonization purposes than that of blending; and he urged proper cleaning and grinding, *plus* blending where necessary.

Mr. F. W. HARBORD said the blending problem in this country was more an economic question than anything else. The difficulty was that there was no low-temperature carbonization process to-day which was generally applicable to all coals in this country; and until there was such a process, it was useless to speak of using low-temperature coke for blending for metallurgical purposes.

Mr. T. P. COLCLOUGH did not agree that England was behind the world in the matter of coal blending. Those connected with the industry knew that the blending of coal for different processes in this country had gone on from the days of their grandfathers. An extensive investigation was being carried out by the Fuel Research Board with regard to the various coals in this country; and this work should be completed before any large-scale attempts were made at blending.

Mr. BROWNLIE, replying to the discussion, said that in Germany and America they had found the right proportions for blending for specific purposes; and they had stuck to these proportions, and gone to work on scientific lines. If they were going to wait for the Fuel Research Board to complete their investigations before anything was done, then they might wait "until the crack of doom." While agreeing that German and American conditions might not apply in this country, he pleaded for a scientific research organization in this country which would tackle the problem of coal blending.

American Chemical Society Jubilee.—Having been founded in 1876, the American Chemical Society will celebrate their fiftieth anniversary in Philadelphia from Sept. 6 to 11 next, when it is anticipated that some 3500 chemists from all parts of the world will be present. The programme will be carried through by eighteen divisional gatherings, one of which will be devoted to gas and fuel chemistry, and another to fertilizer chemistry. The Society will send no direct invitations or requests for the appointment of special delegates from other organizations. Instead, they publicly invite all non-American chemists to attend and take part in the meeting, on the same basis as members of the Society. They will endeavour to see that such chemists are given warm welcome in full fellowship at this gathering. Foreign chemists expecting to attend the meeting should, if possible, send advance information to Mr. Charles L. Parsons, Secretary, Mills Building, Washington, D.C., U.S.A.

DISPOSITION OF MAINS UNDER STREETS.

Views from Abroad.

That the accepted best practice as regards the positioning of gas mains and service pipes under streets in this country is finding confirmation abroad, is shown in a report presented in July last to a Congress of Belgian Communal Engineers. The text of this was reproduced in the May 20 number of our French contemporary, the "Journal des Usines à Gaz," and translated extracts therefrom are given below.

Towards the burning question of the construction or reconstruction of roads to carry heavy modern traffic, all competent authorities, however they may be involved, should direct their attention; and to this end it is urgent that there should be close collaboration between the public utility services, road users, and local authorities.

The effect of a heavy wagon on the bed of a new road is far more adverse than on that of an old one, as far as gas pipes are concerned; in fact, it has been established that in the case of the former, gas escapes are over ten times more numerous than in the latter. It is granted of course [say the Reporters] that perfect gas tightness in a main is impossible to attain; indeed, it is recognized that a new main is sufficiently tight when leakages do not exceed 200 litres per KM.-hour—that is to say, 1700 cub. m. per kilometre per annum. Brussels has a total of about 220 KM. of main pipes; and the unaccounted-for gas amounts to just over 3·5 p.ct., or 1·2 million cub. m. in an annual output of about 37 millions. This is considered to be an exceedingly low figure, below which it is impossible to descend.

It is evident that the deeper the pipes are laid below the surface of the road, the less likelihood there is of their receiving shocks; but what is gained in the cost of upkeep will probably be offset in capital expenditure. Experience has shown, however, that in all soils a more important factor than the depth of the main is the solidity of the road itself and the homogeneity of the bed of the main. Here is an important point, for the authorities often force gas undertakings to lay their pipes at extreme depths, and thus needlessly burden the costs of the work, and in consequence the selling price of gas.

As far as the close collaboration, recommended above, is concerned, the report suggests the following three items as constituting a useful programme from the gas industry's point of view: (*a*) The drawing-up of a joint project for the repair or replacement of pipes at the same time as road surfacing or reconstruction. Where new roads are concerned, plans should be made showing all sub-works. (*b*) Judicious selection of types of mains and joints; and a campaign against any that may be reported upon unfavourably. (*c*) Careful and systematic inspection of pipes, and a scheme for the reporting of escapes to the undertaking concerned by the public, the police, &c.

The report then proceeds to examine these items *seriatim*. The actual positioning of the public services is dealt with under (*a*); and it is recorded that in Belgium the normal practice hitherto has been to place pipes and cables near the middle of the road, and about 1·2 m. deep. Safe enough, if the work has been well done; but the haphazard manner in which the various services from time to time were originally put in has led to great difficulties. For instance, cases have been reported of gas-men setting to work on a water pipe, and of electricians being unable to distinguish between the high and low tension cables; and prolonged searchings for some particular main have cost a fortune in time and public inconvenience.

To-day, the real solution of the problem is to place the gas pipes—in fact, the majority of other services as well—under the footpaths. It is certainly the logical thing to do; and whatever may appear at first blush, it is often not the most costly in original expenditure. The practice has met with great success in many of the main streets of Brussels. Unfortunately, says the report, few towns have footpaths capable of accommodating all the public service conduits; but there is no doubt that the gas services should be among the first to be brought out of the body of the road, for it is these which are most easily deteriorated by fast heavy traffic. Their case differs from that of water mains, in that the latter are placed at a sufficient depth to avoid freezing, and are consequently better protected than gas pipes. Further, a leakage of water discloses itself much more quickly, and in a manner more precise and less dangerous than does an escape of gas.

The question then emerges whether it is better to use one or two main pipes—that is to say, a large pipe under one pavement, or a smaller pipe on each side of the road. The report shows that this matter can be decided by a simple algebraic problem; the result being that, in small or medium-sized towns, the double-main system becomes remunerative as soon as the breadth of the road passes 2·8 times the mean distance between adjacent houses. Apart from first costs, of course, one must bear in mind those of upkeep, repairs, traffic stoppages, &c., for a pipe 0·5 m. under a footpath is far more accessible than one buried beneath the concrete of a modern road.

It is further remarked that the double-main system becomes a paying proposition first for electric cables, then for gas pipes, then for water pipes, and lastly for sewers. In the calculation above referred to, crossings have not been taken into account, nor the special problem of a street not fully developed on both sides.

The report is most emphatic in recommending that old streets should be dealt with on the above lines, and that it is foolish and improvident to leave things as they are on the pretext of shortage of funds. Ways and means, it says, must be found to solve a problem which concerns at the same time the free circulation of transport, the good conduct of the utility services, and the safety of the public. Special credits must be arranged, on the lines that it is unjust to make the interested undertakings bear the cost of the alterations advocated. It is not their fault that modern traffic has developed to such an extent; and besides, in the long run the undertakings must pass on the cost to the consumer. It is considered that it would be equitable to recover the heavy charges incurred by means of a special tax—for example, by a levy on motor vehicles according to their horse-power and tare.

The other sections of the report disclose a strong leaning towards properly protected steel mains, and towards rubber as a jointing material.

ADVANTAGES OF A BOTTOM FLUE OUTLET.

Fulfilling the Requirements of a Gas Cooker.

In a booklet recently published by Messrs. Radiation Limited, the advantages of having the flue outlet of a gas cooker at the bottom, instead of at the top, are dealt with in considerable detail. These advantages include: A higher efficiency; a more equally heated oven; improved cooking, owing to the steam-rich atmosphere which is produced; better utilization of the cooking space; and thermostatic control. These desirable features, it is remarked, are embodied in the "New World" cooker.

To satisfy the cooker oven tests of the Institution of Gas Engineers, a modern gas oven of the packed type must fulfil the following requirements.

(i.) It must be capable of attaining a temperature of 400° Fahr. twelve minutes after lighting.

(ii.) Also it must be possible, with the door and all other joints sealed, to increase by at least 60 p.ct., without smothering, the gas consumption necessary to satisfy the first condition. [Messrs. Radiation, it may be mentioned, have adopted a standard of 100 p.ct. overload.]

(iii.) Thirdly, it must be possible to load the oven fully with foodstuffs, and cook the latter without altering the position of any article. The "New World" oven passes these tests.

It is stated in the booklet that many cookers of the ordinary type with the flue outlet at the top would satisfy the first and second requirements set out in the foregoing paragraphs, but that few would satisfy the third requirement. If, with such cookers, the flue outlet is brought to the bottom of the oven, it is then found that they no longer have a suitable factor of safety. Messrs. Radiation say that it is impossible to make ordinary gas ovens, by removing the flue from the top to the bottom, satisfy conditions (ii.) and (iii.). They remark that an improvisation can be effected with ordinary types of oven to enable the advantage of the bottom flue outlet to be partly attained while still satisfying the non-smothering condition. A flue outlet can be made directly through the back, at the bottom of the cooking space, of ovens that have not been specially constructed for a bottom flue outlet; but when this is done the products will not pass away unless a suitable length of flue is attached to give the necessary "pull." This expedient, while it prevents smothering, causes more air to pass through than is necessary in a properly designed oven with the flue outlet at the bottom, and consequently there is a drop in thermal efficiency. It is essential that the additional pull shall not be attained by leading the products up between the cooker linings, for condensate will cause corrosion in such a flue passage.

For a gas oven to satisfy all three conditions, an entirely new burner system and general oven arrangement had to be provided. It was only after prolonged and careful research work that Messrs. Radiation discovered means of so using the bottom outlet as to produce a new type of cooker satisfying these conditions and attaining a high thermal efficiency, and capable of thermostatic control.

Messrs. Radiation conclude their new booklet by remarking that it must not be overlooked that the higher the efficiency of a gas oven, the greater the amount of condensate produced. Unless efficiency is to be sacrificed, the formation of this condensate in the initial stages of heating-up is unavoidable, and the necessity for restricting the formation of condensate sets a limit to the development in efficiency which might otherwise be effected. It is owing to the formation of condensate that a direct, or readily accessible, flue outlet is essential.

THE KING SEAM OF THE LANCASHIRE COALFIELD.*

Report of the Fuel Research Board.

"Physical and Chemical Survey of the National Coal Resources, No. 6," which has just been published by H.M. Stationery Office, is a study of the King Seam of the Lancashire coalfield, carried out by the Department of Scientific and Industrial Research (Fuel Research Section), and in it are described laboratory experiments undertaken by the Lancashire and Cheshire Coal Research Association.

The report begins by a general description of the Lancashire coalfield. The King Seam, or its equivalent, is recognized over a considerable area of this field. It is variable in thickness and quality. In some areas, where it is of good quality, the seam has been, and is still being, extensively worked; in other districts it contains a large number of dirt bands which render the coal, under present conditions, unprofitable for working. In this connection an examination of the dirt bands has been included in the report, as it is hoped that investigation will result in the possible utilization in industry of some of the low-grade material. Should economic methods of using such low-grade fuel be perfected, inferior seams would then, in many instances, become workable.

At its best the seam consists usually of two coals separated by a shale or dirt parting of varying thickness. In the South Lancashire coalfield, a band of cannel frequently occurs at the top of the seam. The coal, which is bituminous and moderately caking, is mainly employed for manufacturing purposes. The better qualities and lump furnish a house fuel, and the coal is also employed to a limited extent for gas making and as a bunker fuel.

The volatile matter is high, ranging from 36 to 43 p.ct. calculated on the coal exclusive of moisture and ash. The percentage is generally somewhat higher in the top coal than in the bottom.

The ash content of the seam varies considerably in different districts and also frequently in different horizons of the same section. While the seam is of inferior quality, the amount of ash is largely influenced by the number of dirt bands present and the extent to which they are removed. Even after the removal of all visible dirt, it is stated, the inherent ash content of the coal in some parts of the field is still high. This is particularly noticeable in the neighbourhood of the Irwell Valley fault.

The percentage of nitrogen in the coal is fairly high, the average figure being about 1·6 (calculated to dry coal).

The sulphur content is somewhat variable, ranging from 1·5 to 3·5 p.ct. The figures (on the dry coal) obtained for samples of the seam from different localities are as follows:

Locality.	Burnley.	Bickershaw.			Coppull.	
		Upper King.	Lower King.	Queen.	Section A	Section B.
Sulphur, p.ct. .	3·39	2·85 (tops) 3·64 (bottoms)	1·98 (tops) 2·12 (bottoms)	1·69	2·75	2·94

The complete ultimate analyses of samples of the seam are summarized in the following table:

Calculated to Dry Coal.

Locality.	Burnley.	Bickershaw.		Coppull.	
		Lower King.	Queen.	Section A.	Section B.
Ash	3·95	3·80	2·52	5·46	6·26
Carbon	79·64	76·96	80·55	73·86	74·40
Hydrogen	4·96	5·01	5·30	4·61	4·70
Nitrogen	1·56	1·62	1·74	1·29	1·49
Sulphur	3·39	1·98	1·69	2·75	2·94
Difference (oxygen and errors)	6·50	10·63	8·20	12·03	10·21

The calorific values (air-dried coal) of the various samples of the seam are as follows:

Locality.	Burnley.	Clifton.	Bickershaw.			Coppull.	
			Upper King.	Lower King.	Queen.	Section A.	Section B.
B.Th.U. per lb.	14,290	11,440	12,820 (tops) 13,950 (bottoms)	14,000 (tops) 13,650 (bottoms)	14,050	13,690	13,700

The behaviour of the coal during carbonization in the laboratory assay apparatus at a temperature of 600° C. has been studied. For this purpose, samples representing the average composition of the whole seam (shale and dirt bands excluded) from the Burnley and Coppull localities were utilized. The coke obtained in both cases showed no swelling, and was firm and hard. The yields of tar, gas, &c., were also similar. The assay test was also carried out on a sample of the Queen Seam from the Bickershaw district. The results obtained were in general agreement with those of the two previous samples. The report states that the coal would be suitable for low-temperature carbonization without blending.

In view of the high percentage of ash in the coal itself from the Bryn (Ashton-in-Makerfield) district, a series of coal-washing tests on the different sub-sections of the seam was undertaken to determine to what degree purification could be effected by this means. The separation was secured by the "float-and-sink" test in calcium chloride solution of 1·35 specific gravity. The detailed examination clearly shows that the seam lends itself to purification by washing.

* "Physical and Chemical Survey of the National Coal Resources, No. 6—The Lancashire Coalfield, the King Seam." Department of Scientific and Industrial Research (Fuel Research). Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. 6d. net.

Nautilus Chimney Pieces.

The Nautilus Fire Company, Ltd., have published a series of illustrations of complete Nautilus mantel suites embodying Davis gas grates. The first thing which strikes one in looking through this handsome publication is the refinement of even the simplest and least expensive of the chimney-piece designs. The artistry of the complete suites is calculated to make an immediate and lasting appeal to persons of taste. At the end of the publication is an illustration of a section of a house indicating the function of the "Nautilus Economy" gas flue. The latter consists of a number of cast-concrete blocks built into the thickness of the wall. These flues enable substantial sums to be saved in building construction in the absence not only of the projecting chimney-breasts that the orthodox 9 in. by 9 in. brick flue involves, but also of foundation concrete, brick footings, trimming joists and trimmers, concrete hearths, skew-back arches, and large brick chimney-stacks. The economies effected by the employment of "Economy" flues are substantial. In a recent case of a block of flats, their use resulted in a saving of half-a-million bricks, or £100 per stack.

Adaptable Pipe Union.—A convenient union described and illustrated in "Engineering," and manufactured by the Adaptable Union Company, of 155, Fenchurch Street, London, E.C., is provided with two spherical seats; and as these have a common centre, a tight joint can be made with them, even though the pipes may not be in exact line. Such deviation from alignment does not prevent a full-bore passage. When the union is being screwed home, it adapts itself to the conditions; and a tight joint is ensured without any springing of the pipes or other straining action. Further, it does not shake loose when subjected to vibration.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Corrosion of Gas Mains.

SIR,—We are much interested in the report of a paper by Mr. C. Frye, of the Dunedin Corporation Gas-Works, New Zealand, on the rapid corrosion of gas mains in his district, published in your issue for May 26.

We should like to call the attention of Mr. Frye, and other gas engineers who may meet with similar trouble, to the properties of "Prodorite," a new acid-resisting pitch concrete of Swiss origin, which is now being manufactured in this country.

"Prodorite" is a true concrete with mechanical strength fully equal to the best cement concrete, but entirely non-porous and gas and water tight, and, at the same time, completely impervious to the action of all dilute acids. The cost of "Prodorite" pipes is not very greatly in excess of that of ordinary concrete pipes; and thoroughly satisfactory joints can be made in laying a pipeline.

We may mention also that we are manufacturing tanks and other chemical plant, and flooring for use in contact with acids and other corrosive chemicals, which should in many cases prove useful to gas engineers.

J. H. WEST.
Director and Technical Manager.

Prodorite Limited, Aldwych House, Aldwych.
London, W.C. 2,
June 11, 1926.

Cheaper Gas at Strabane.—The Strabane Urban District Council have decided to reduce the price of gas from 6s. to 5s. 6d. per 1000 c.ft. The reduction is to date from July 1.

REGISTER OF PATENTS.

Gas Burners.—No. 250,635.

HELPS, G., of Nuneaton.

No. 30,054; Dec. 15, 1924.

This invention relates to atmospheric gas burners, and has for its object an adjustable nipple automatically regulated by the movement of the gas cock.

The arrangement is characterized in that a rotary sleeve, adapted to be operated preferably through gear wheels on turning the gas cock, is connected by a pin passing through a spiral guide slot to the longitudinally movable nipple regulator.

Fuel Distillation Apparatus.—No. 251,051.

MERZ & MCLELLAN, of Victoria Street, S.W. 1, and WEEKS, E. G., of Dunston.

No. 5149; Feb. 25, 1925

This invention, relating to fuel distillation apparatus, has for one of its objects to promote a more even distillation and also a more even passage of the material in the retort. The invention is applicable to low-temperature distillation by internal heating, although it is not limited to this.

The object is attained by the employment of, and manner of operating, extractor devices; and broadly it comprises a pocketed extractor device whereof the capacity of a pocket at one position in the extractor is different from the capacity of the pocket in another position therein. The capacities are so related to one another, according to the cross-sectional contour of the lower end of the retort which is served by each pocket, that a substantially uniform rate of extraction of solid material throughout the whole cross-section of the retort is maintained.

No. 251,052. (No. 5150; Feb. 25, 1925.)

This invention is particularly applicable in conjunction with extractor devices such as are described in the above specification, No. 251,051, though it may still have advantages when other devices are utilized. The patentees find that improved results are obtained if the contents of a retort are not kept constantly moving, but are virtually divided into vertical zones, some of which are moving while others are relatively quiescent.

The present invention comprises a method of operating a retort during extraction of the coke in such a manner that in a plurality of vertically disposed zones of the charge there are obtained alternating time-periods respectively of quiescence of the charge and of movement thereof through the retort. Preferably, during any particular time-period, a zone in which there is movement is bounded on one or on each of the two opposite sides by a zone of quiescence, and vice versa.

Broadly, the apparatus comprises a plurality of extractor rollers or other devices arranged side by side across the retort outlet, and means to cause some of the devices to remain stationary while others are operated. Means may be provided for reversing at will the direction of rotation of some or all of them.

In a preferred form, the rotating means comprises a toothed wheel in fixed relation with the roller, an oscillatory arm, a ratchet device mechanically coupling the arm to the toothed wheel, and means to operate the arm.

Full details and drawings are given, together with 15 claims.

Discharging Vertical Retorts.—No. 251,043.

WOODALL-DUCKHAM (1920), LTD., RICHARDS, F. B., and REBER, J. W., all of Grosvenor Gardens, S.W. 1.

No. 3517; Feb. 7, 1925.

This invention provides a substitute for the discharge arrangement in which the greater part of the weight of the column of fuel is supported by an inclined surface, though actual discharge is by gravity, assisted by radial arms forming pockets.

According to the present invention, the column is supported on a surface from which it has substantially no tendency to be discharged under action of gravity; and the coke is removed from the bottom of the column by the sweeping movement of an extractor placed beneath the surface and operating through openings.

The extractor may be a rotating shaft carrying radial arms much in the manner of the known devices; but the arms no longer serve to receive the coke and are not placed so as to prevent free discharge of coke over the edge of the surface. On the contrary, the arms, which are preferably curved in the direction of rotation of the shaft, are caused to move in the spaces of a grid-like device so as to produce the desired sweeping movement. The known heavy flap or flaps suspended in front of the material may be used to aid in checking uncontrolled discharge of the coke from the column.

The coke descends from the retort in a vertical path until it arrives on the support. The arms pass through relatively narrow spaces in the grid with a minimum clearance between themselves and the grid. The action of the arms should be limited as far as possible to sweeping the lower part of the column of fuel from the grid, and should not have any pronounced lifting effect; and with this in view, practically only the tips of the arms are used, so that the resolved movement vertically during the circular movement of the arm is gradually reduced during the operation.

The arms may be arranged helically on the shaft in known manner, or may be placed strictly parallel to each other.

The design is clearly shown in the sectional drawings which we reproduce.

Dry Gasholders.—No. 251,222.

KLONNE, AUG., of Dortmund (Assignees of SCHULZ, G. C., of Hamburg).

No. 4458; Feb. 16, 1926. Convention date, July 18, 1925.

The patentees, introducing their invention, remark that in the usual construction of dry gasholders the casing of the holder is composed of separate sheet-iron plates connected with one another and with the corner posts of the casing of the holder by riveting. In so far as lap-riveted or butt-riveted joints are employed the rivets must be countersunk on the inner side. In order to obtain a smooth surface for the sliding piston very careful and consequently expensive workmanship is required. For the purpose of obviating this work as far as possible the plates are first flanged at the edges and then these flanges are connected on the exterior of the holder by rivets. Since, in view of the plate thicknesses of from 3 to 4 mm. usually employed, caulking of the connection is feasible, a jointing band is riveted in between the seams. Furthermore, it is not possible to flange the edges at such a sharp angle as to produce a completely smooth surface in the interior of the holder, quite apart from the fact that the accurate fitting-in of the plates would in this case also occasion serious difficulties. Hence at the joints produced by flanging and riveting there occur grooves through which the sealing liquid passes.

In order to remove these objections, according to the invention, the individual plates of the casing are inserted into a framed structure or lattice-work scaffolding by welding in such a way that a completely smooth inner wall is obtained.

The design is further characterized by the feature that the vertical joints between the plates are arranged in front of the vertical iron sections and the horizontal joints in front of the horizontal iron sections of the framed structure

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 12.]

Nos. 11,566-11,991.

GAS RESEARCH COMPANY.—"Calorimeters and metering devices therefor." No. 11,745.

LAMBOURNE, R.—"Gas, &c., joints for rubber tube connections." No. 11,751.

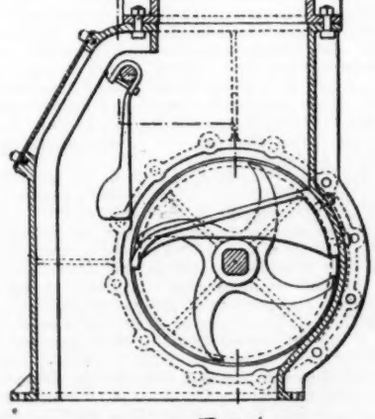

FIG. 1

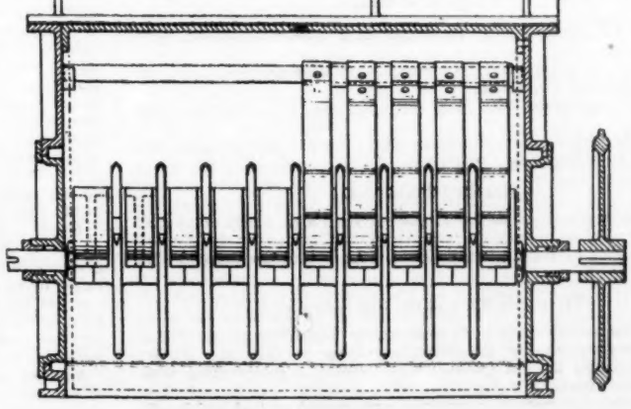

FIG 2

Vertical Retort Discharger—Woodall-Duckham, Ltd.

McCORMICK, B.—" Distillation of carbonaceous materials." No. 11,945.
RICHMOND GAS STOVE AND METER COMPANY, LTD.—" Gas-heated toasting apparatus, &c." No. 11,909.
RUSSELL, G. D.—" Refractory blocks for gas fires, &c." No. 11,594.
SLACK, J. W.—See Richmond Gas Stove and Meter Company, Ltd. No. 11,909.
TURNER, E. H.—See Russell, G. D. No. 11,594.
WHITE, A. E.—See Gas Research Company. No. 11,745.
WILTON, N. & T. O.—" Combined tar dehydrating and bitumen melting and mixing plant." No. 11,725.

[Extracted from the " Official Journal " for May 19.]

Nos. 11,992-12,494.

BAMAG-MEGUIN AKT.-GES.—" Method of utilizing waste heat in production of water gas." No. 12,150.
COOPER, J. E. L.—" Gas retorts." No. 12,328.
FRAZER, J. K.—" Gas scrubbing and washing apparatus." No. 12,331.
HUMPHREYS & GLASGOW, LTD.—" Heating buildings." No. 12,145.
MEES, W. H.—See Cooper, J. E. L. No. 12,328.
SOCONY BURNER CORPORATION.—" Heating systems." No. 12,158.

[Extracted from the " Official Journal " for May 26.]

Nos. 12,495-13,089.

ALLAN, A. B.—" Gas lighting apparatus." No. 12,958.
AURIG, M.—" Gas washers, &c." Nos. 12,603, 12,604.
BRUCKLMAYR, G.—See Aurig, M. Nos. 12,603, 12,604.
CHILOWSKY, C.—" Manufacture of gas from heavy oils." No. 12,815.
COLEY, H. E.—" Manufacture of gas." No. 12,829.
DEMPSTER & SONS, LTD., R.—" Furnace linings." No. 12,543.
DEMPSTER & SONS, LTD., R.—" Gas retort plant." No. 12,835.
GIBSON, J. W.—" Production of enriched water gas." No. 12,660.
HASSALL, J. K.—" Radiants for gas fires." No. 12,879.
HOUSE, G.—" Gas valves." No. 13,087.
HUMPHREYS & GLASGOW, LTD.—" Manufacture of gas." No. 12,705.
INTERNATIONAL COMBUSTION ENGINEERING CORPORATION.—" Heat-treatment, &c., of coal." No. 12,590.
INTERNATIONAL COMBUSTION ENGINEERING CORPORATION.—" Carbonizing or cracking fuels." No. 12,710.
INTERNATIONAL COMBUSTION ENGINEERING CORPORATION.—" Carbonizing coal." No. 12,816.
MELLOR, P. H.—See Hassall, J. K. No. 12,879.
MILLER, H. P.—" Apparatus for cleaning dust, &c., from gas burners." No. 12,871.
STELFOX, J. C.—See Humphreys & Glasgow, Ltd. No. 12,705.
TAYLOR, F. W., and TAYLOR & CO., A.—" Means for clearing-out manhole traps, &c., of gas mains." No. 12,700.
TOOGOOD, H. J.—See Dempster & Sons, Ltd., R. Nos. 12,543, 12,835.
YATES, H. J.—See Hassall, J. K. No. 12,879.

[Extracted from the " Official Journal " for June 2.]

Nos. 13,090-13,672.

AMERICAN GAS CONSTRUCTION COMPANY.—" Valves." No. 13,226.
CLEMMOW, E. P.—" Gas burners." No. 13,442.
COMPAGNIE DE BETHUNE.—" Treatment of gases obtained from distillation of coal." No. 13,434.
COMPAGNIE DE BETHUNE.—" Manufacture of petroleum spirits from methane, &c." No. 13,435.
FRANKFURTER GASGES.—" Production of carburetted gas." No. 13,672.
GILL, G. M.—" Method of cooling coke, &c." No. 13,558.
GROVES, W. W.—See American Gas Construction Company. No. 13,226.
GRUNDY, A.—" Carbonization of coal." No. 13,429.
HENRY, I. W.—" Manufacture of benzole, &c." No. 13,525.
LESSING, R.—" Cleaning carbonaceous materials." No. 13,402.
NUSS, M.—" Gas-fired kilns, &c." No. 13,617.
PINTSCH AKT.-GES., J.—" Gas meters." No. 13,100.
SCHUMACHER, E.—See Frankfürter Gasges. No. 13,672.
TERRELL, T.—" Manufacture of inverted incandescent gas mantles." No. 13,282.
TILLMETZ, F. P.—See Frankfürter Gasges. No. 13,672.
WARD, T. E.—" Gas fires, &c." No. 13,321.

[Extracted from the " Official Journal " for June 9.]

Nos. 13,673-14,212.

BENSON, R. S.—" Conveyers." No. 14,074.
CANNON IRON FOUNDRIES, LTD.—" Ovens of gas stoves." No. 14,135.
FISCHER, F.—" Purification of gases from sulphur." No. 14,091.
FOX, T.—" Prepayment mechanism." No. 13,915.
GODWARD, E. R.—" Production of a dry gaseous fuel." No. 13,939.
GRAVE, O.—" Incandescent gas lamps." No. 13,753.
HAWTHORNE, H. S.—See Cannon Iron Foundries, Ltd. No. 14,135.
HEAD, WRIGHTSON, & CO., LTD.—See Benson, R. S. No. 14,074.
HODGSON, A. E.—" Apparatus for producing oil gas." No. 13,762.
HUMPHREYS & GLASGOW, LTD.—" Manufacture of water gas." No. 14,200.
HUMPHREYS & GLASGOW, LTD.—" Valve-operating mechanism." No. 14,201.
I. G. FARBENINDUSTRIE AKT.-GES.—" Process for obtaining light oils by washing gases." No. 13,895.
JONES, N. C.—See Hodgson, A. E. No. 13,762.
NEIL, J. M.—" Measuring instruments, &c., for pipe lines, &c. No. 14,134.
PINTSCH AKT.-GES., J.—" Gas meters." No. 13,787.
RADIATION, LTD.—" Plate racks, &c." No. 14,131.
RADIATION, LTD.—" Gas burners." No. 14,188.
ROBINSON, S.—See FOX, T. No. 13,915.
RUSSELL, W.—See Radiation, Ltd. No. 14,131.
STELFOX, J. C.—See Humphreys & Glasgow, Ltd. Nos. 14,200, 14,201.
TROPSCH, H.—See Fischer, F. No. 14,091.
YATES, H. J.—See Radiation, Ltd. No. 14,188.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Ascot District Gas and Electricity Bill, and Darwen Corporation Bill: Returned from the Commons, agreed to, with amendments, which were considered and passed.

Special Orders.

The Liverpool Gas Order (1926) and the Seaford Gas Order (1926) have been referred to the Special Orders Committee.

HOUSE OF COMMONS.

Progress of Bills.

Darwen Corporation Bill: Read the third time, and passed, with amendments.

Halifax Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Chorley Corporation Bill: Read the first time, and referred to the Examiners.

Public Health (Smoke Abatement) Bill: Read a second time, and committed to a Standing Committee.

Gas Regulation Act.

Copies were presented to the House on June 8 of drafts of Special Orders proposed to be made by the Board of Trade under the Act, on the applications of the Liverpool Gas Company and the Seaford Gas Company, Ltd.

Electricity Bill and the Gas Industry.

At last Thursday's sitting of the Standing Committee of the House of Commons considering the Electricity (Supply) Bill, Mr. R. G. Clarry stated that the gas industry was desirous of co-operating with the electricity industry through the Bill, primarily on the selection of sites and the formation of schemes with regard to fuel and localities, and at a later stage on distribution. The Attorney-General said he welcomed the assistance of the gas industry in the matter.

HALIFAX CORPORATION BILL.

This Bill came before Section B of the Local Legislation Committee of the House of Commons, under the Chairmanship of Mr. RAINE, on Tuesday, June 8. Part V. of the Bill related to gas matters, but there was no opposition.

Mr. JEEVES, K.C., who, with Mr. Maurice Fitzgerald, appeared for the Corporation, explained that the gas portion of the Bill contained the necessary provisions in the case of a gas undertaking changing-over from the illuminating power method of charging to the calorific value system. Thus the figures given in the Bill as representing the various maximum charges which may be made are merely the arithmetical conversion to a therm basis of the existing authorized charges under the illuminating power standard. The therm charge becomes a maximum of 1s. 3d. per therm; the Department may charge 3d. extra per therm for the hire of fittings where a cooking stove is included, or 2·5d. per therm extra if a cooking stove is not included. Where the gas is taken through a prepayment meter and no fittings are hired, then the extra charge may be 1·5d. per therm, or 10 p.ct. per annum on the cost of the meter, whichever is the greater. These charges for the hire of fittings include repairs and maintenance. Provision is made for the revision of price at the instigation of the Corporation, or of any local authority within the area of supply, or of twenty consumers.

Mr. W. B. MCLUSKY (Gas Engineer to the Corporation) said that on the basis of 400 B.Th.U. gas, which is the standard provided for in the Bill, the charge would be 1s. per therm.

There are the usual clauses with regard to the calorific value standard, which is fixed at 400 B.Th.U.; the Corporation having to give notice of their intention to change this figure, and also being liable to pay for the cost of altering consumers' fittings when any changes are made. The pressure of the gas at 400 B.Th.U. is to be 2 in., at 350 B.Th.U. it is specified as 2¼ in., and below 300 B.Th.U. not less than 3 in.—the precise figure to be determined by the Gas Referees.

Another of the clauses in the Bill proposes the following addition to section 13 of the Gas-Works Clauses Act: " Provided that every such contract entered into by the undertakers shall be alike in terms and amount to all consumers of gas supplied in like circumstances for the same purpose."

There are also a number of ordinary clauses relating to supply to consumers having separate supply pipes for ancillary purposes, cutting-off supplies, and so on. The Corporation also take powers to specify the sizes of pipes for consumers' premises, and also to compel consumers whose pipes are in a dangerous condition to repair them. Failing such repair, the Department may cut off the supply of gas.

On this latter clause there was a report from the Board of Trade to the effect that, though a clause of such a meaning had been inserted in some Special Orders, there appeared to be some doubt as to the powers of gas undertakers to enter premises for the purpose of inspection. The Board therefore suggested that, if this clause be allowed by the Committee, it should have some words added to it giving the right of entry for the purposes of inspection. Words to this effect were added to the clause. The Board of Trade also suggested that there should be a right of appeal against any decision of the officials of the gas undertaking in this regard.

Mr. MAURICE FITZGERALD resisted this latter suggestion on the ground that action would only be taken if the pipes were in a dangerous condition, and any suggestion of an appeal would merely permit the danger to exist for a longer period.

The Committee did not insist on the right of appeal, and the clause was passed without any such provision. It is provided that the clause is not to apply to railway companies' premises except dwelling-houses belonging to such companies.

Other clauses include relief to the Department from obligation to supply—except for lighting or domestic use—where the capacity of the mains is not sufficient, unless the person wanting a supply enters into an agreement to pay the reasonable cost of the main, or guarantees to pay a minimum sum for gas supplied; and powers to maintain showrooms. As a matter of fact, the Department already have showrooms.

This concluded the gas section of the Bill.

LEGAL INTELLIGENCE.

HELPS v. OLDHAM CORPORATION.

Tuesday, June 8.

Mr. *James Swinburne*, an expert, continuing his evidence on behalf of the Oldham Corporation, stated that it was material to the form of plaintiff's patent claim that the Corporation had not a generator at Oldham separate from the vertical retort in the apparatus. According to the patent, this must be separate. He would not say that the plant at Nuneaton or Oldham came within the claim of patent No. 150,812, which was a plant for the manufacture of gases from vertical retorts.

Wednesday, June 9.

Mr. *Alfred Lawrence Booth*, Consulting Engineer, A.I.C., a member of the Council of the Institution of Chemical Engineers, was called for the defence. He said that, during the test he made, the plant at Nuneaton operated merely as a producer gas plant. The plant was substantially free from liability to stoppage; in fact, it should work for weeks without blockage, unless a very dusty coal was used. There would be less chance of blockage with the superheater tubes removed from the chamber.

His LORDSHIP inquired whether the plant at Nuneaton was of a later date than the Oldham plant.

Witness thought it was.

Mr. WHITEHEAD, K.C., observed that the plant at Nuneaton, subject to the superheater, was a replica of that at Oldham, and was first used in June, 1920, while that at Oldham was used in September, 1920. The superheater tubes in the chamber at Nuneaton were taken out within four months of June, 1920.

Witness remarked that this would free the plant from such chance of blockage as there might be in the superheating arrangement. Turning to his tests, witness said that at Higginshaw he did not record any temperature inside the retort sufficient for the distillation of coal. At Higginshaw the retort was kept substantially full the whole time, and coal never got below the retort. There was substantial risk of blockage in the plant. When the last test was made, Dr. Davidson asked that all the airholes to the superheaters should be blocked up; so that it seemed to witness that, in addition to the plant not distilling coal, it was not being worked in the manner in which it was designed to be worked. The Higginshaw plant was yielding only producer gas. Exclusive of the generator, all the parts of the plant were too small; and since the retort did nothing except act as a feeder, it was unnecessary and perhaps detrimental if it tended to form a cone of less-heated fuel in the centre. When worked slowly, the plant would make good producer gas, but it was not a good producer.

Witness, cross-examined, said the Higginshaw plant worked on a non-caking coal as a producer plant for short periods. When so worked it gave from 14 to 19 million B.Th.U. per ton of coal used. Notwithstanding that, even as a producer plant the Higginshaw plant was inefficient; and in this respect he was contemplating both thermal and working efficiency. When he went to Oldham he found the plant working on a special coal. For the plaintiff's plant, the proper coal was being used as a producer fuel—a coal free from fines and low in ash. He understood that Sir Dugald Clerk, who was to give evidence for the Oldham Corporation, mentioned, in his presidential address to the Institution of Gas Engineers, the calorific value of producer gas as 135·3 B.Th.U. per c.ft. But witness put the figure at from 158 to 165 B.Th.U. He had worked various producer plants at from 160 to 164 B.Th.U. per c.ft.

Thursday, June 10.

Mr. *Booth* (cross-examined by Mr. WHITEHEAD) said the B.Th.U. content of coal used in a Nuneaton test was 14,600 per lb.

Mr. WHITEHEAD: Why, diamond is the purest form of carbon. If one were so unwise as to burn a pound of diamond chips, the maximum heat developed would be 14,600 B.Th.U. per lb. On your analysis, the coal at Nuneaton gave a figure the same as pure carbon.

Witness: Why not? The theoretical heat obtainable from a pound of coal is higher than that obtained from a pound of carbon.

COUNSEL: If you have regard to the plant, either at Nuneaton or Oldham, in operation, you have there operating a retort functioning as a retort, but only carbonizing coal at low temperatures.

Witness said he did not agree. It was not carbonizing coal at all.

COUNSEL: This was the test plant, and a new plant. You would expect some difficulties to occur; and, as a designer, would you expect to be free to cure them as they arose?

Witness: Yes.

His LORDSHIP: Do you say that you have to stop the plant to clean out a single superheater?

Witness said he thought that was so.

COUNSEL: When the Higginshaw plant was opened up after the trials, were you surprised to find it so clean?

Witness: I thought it dirty.

COUNSEL: You know that requests had been made that something should be done to keep the plant clean?

Witness: The only requests were for things to be done at the top of the superheaters.

COUNSEL: Assuming it was not meant to work all eight units simultaneously at Higginshaw, there would be no difficulty in cleaning the plant that was standing by?

Witness: Generators could have been cleaned. One would have to have two units off to clean the superheaters.

Mr. *William Moncrieff Carr*, Engineer and General Manager of the Stretford and District Gas Board, said that the Oldham plant agreed with his idea of a producer plant. He saw nothing at the tests to lead him to believe that destructive distillation took place more than in any producer plant. The mains to take the gas from the retort at Oldham were too small. They were of the size for a small coal gas retort in which coal was distilled only. Moreover, an 8-in. diameter main was provided to take gas which required an 18-in. main, if frictional loss was not to interfere with the vacuum. The superheaters, particularly those with pipes inside, did not provide adequate area. Nobody would make such an arrangement to pass gas through, and expect to get crude gas, or gas before it was cleaned, circulating continuously. No valves were provided to enable the superheaters to be cleaned without stoppage or without opening a part where the vacuum would be interfered with. The plant was never intended to be run with steam as demanded by the plaintiff. It would be commercially impracticable to run it with such an enormous amount of steam passing into the mains to keep them clean, as was asked for. Analysis of the gas at Nuneaton practically agreed with what, in the table of Dr. Davidson's book, was given as that of producer gas. He did not think there was, in the specification of Mr. Helps, anything additional to the knowledge of gas manufacture in 1918. Similar ideas had been formed on the Continent.

Friday, June 11.

Mr. *W. Moncrieff Carr* said he had tested the efficiency of various grades of gas, and, instead of the results of low-grade gas being better than those of high-grade gas, as Mr. Helps contended, he found that, with one type of burner, the result with gas of 500 B.Th.U. per c.ft. was 2 p.ct. higher than with gas of 350 B.Th.U. quality. With another type of burner, the results with the 350 B.Th.U. gas were slightly better. This was only a matter of correct gas and air adjustment.

Witness agreed with Counsel that he asked for some records to be made at irregular hours, and they yielded, between 1.15 and 3.30 a.m., from 176 to 199 B.Th.U. Then they went down at 4.50 to 189.

COUNSEL: If you assume the calorific value of the gas from the Nuneaton plant at 180 B.Th.U., and 160 B.Th.U. is the calorific value of producer gas, should you not say that Mr. Helps's "Pleno" plant yielded something other than producer gas?

Witness: No. It all depends on the temperature in the producer, and the amount of steam passing through.

COUNSEL: I put it to you that the reason the producer gas is normally 160 B.Th.U. is that the plant is worked for a maximum efficiency at the expense of maximum calorific value?

Witness said that he had known producer gas as low as 130 and as high as 190 B.Th.U. He did not suggest the plaintiff altered the pull intentionally to produce results. He added that the Oldham plant worked as a producer plant. The amount of steam used was abnormal. He agreed that more would be required than was needed for cleansing only, but he held that the amount of steam was too much and not economical. The cost of production of low-grade gas was as great as that of high-grade gas, and often much higher. He would not state that Mr. Helps's plant would not produce 20 million B.Th.U. per ton when working alone; but it would not do this, he thought, when working with the rest of the plant.

COUNSEL suggested that defendants' tests were vitiated by failure to record saturated hydrocarbons, and that the research body of the Institution of Gas Engineers had said the failure to record these would introduce serious error.

Witness replied that, in accurate gas analysis, saturated hydrocarbon would be detected if more than 1 p.ct. He was not surprised to find 2 p.ct. in one test here, and none in the rest. Low fire, shortly after charging the retort, might produce distillation to a limited extent, but it was only on such an exceptional occasion that it would recognizably occur. One per cent. of saturated hydrocarbon would represent 20 to 25 B.Th.U.

The hearing was adjourned until Tuesday, June 15.

MISCELLANEOUS NEWS.

SOUTH AFRICAN LIGHTING ASSOCIATION, LTD.

Annual General Meeting.

The Thirty-Seventh Ordinary General Meeting of shareholders was held last Wednesday, at the London Offices, 48, Copthall Avenue, E.C.—Mr. WILLIAM CASH (the Chairman) presiding.

The SECRETARY (Mr. William Cash, jun.) read the notice convening the meeting, the minutes of the previous meeting, and the report of the Auditors.

The CHAIRMAN, in moving the adoption of the report of the Directors and the statement of accounts for the year ended Dec. 31 last, said he felt that the shareholders would concur in the Directors' regret at the disappointing results which the accounts exhibited; and he proposed to offer an explanation of how the present position had arisen. It would perhaps be more convenient if he dealt with Grahamstown first. It would be recalled that in July, 1924, the electric light undertaking of the Corporation there was brought into operation; and therefore as far as that year was concerned the Association only felt the competition for six months, whereas in 1925 they had it for the whole year. Thus this year the true comparison would be with 1923, in order to see the full effect of the competition; and such a comparison showed that the sale of gas had fallen off by 43 p.ct. This was very much what the Board had anticipated when they learned that the works were going to be erected. Expressed in profits, the effect in 1925, as compared with 1924, was a drop of £1000. In the profit and loss account, it would be seen that the balance of net revenue was £2711. At Port Elizabeth they had had a very difficult series of events to combat during the past year. When they met twelve months ago, Mr. William Arnott had just returned from his visit to that town. He had gone out specially to inquire into the matter of leakage (which for a considerable period had caused the Directors concern), and had taken various steps, which were quite correct in the sense that they were work carried out in the right direction. They related to mains and services; and Mr. Arnott did not discover anything very much there. It would be remembered that simultaneously Mr. P. C. Cleasby (their new Engineer) went out, with good testimonials from his old employers the Guildford Gas Company. He had arrived in March, 1925, and sent on reports showing that a good deal required to be done in the way of repairs and renewals. The works had, in fact, been allowed to get into an unsatisfactory state. However, Mr. Cleasby's health apparently was very adversely affected by the climate; and he did not put in hand the work which even he himself had suggested ought to be done. His unhappy death followed on July 24, 1925, without his really having done any work of substantial value to the Association. This had placed the Association in a very unfortunate position; but luckily they had been able to get assistance from the Cape Town Gas Company, to whom they were much indebted. They sent up one of their assistants, Mr. Ratcliffe, to help the Association; and he, also, reported that the works needed a good deal doing to them. The Directors looked around for a new Engineer, and ultimately appointed Mr. J. E. B. Potter, a comparatively young man with first-class testimonials, who had had experience with the Brentford Gas Company, which was likely to prove of value. He arrived in South Africa on Nov. 30 last, and, of course, had had no time to do anything there which could affect the results for 1925. The Board, however, believed that they had secured the right man; and it was quite evident that he was putting his back into the work. From the returns for the first quarter this year, it appeared that Mr. Potter had got the leakage down by some 4 or 5 p.ct.; but even to-day this "mystery" had not been solved, and the question still remained a very serious one. They had the help of engineers highly skilled in the subject—Mr. Jesse F. Scott (their Consulting Engineer) and Mr. Henry Woodall (a Director)—and had tried every means to find out to what the leakage figure was really due. A lot of money had been spent two years ago in overhauling the meters. Mr. Potter had found some broken mains; but nothing like sufficient to account for the figure by which they were confronted. He had also taken in hand the repairing of the gasholders. Two of these were certainly in a bad state; and possibly some leakage had taken place from them. Mr. Potter had sent full details of the general condition of the works; and undoubtedly there was a great deal that required to be done. He feared that, in spite of reports sent home from time to time that the works were in an efficient state of repair, they had, owing to the war and the difficulty of getting materials, been allowed to get into a condition which was anything but satisfactory.

FINANCIAL POSITION.

The shareholders might ask what effect this was going to have on the finances of the Association. The renewal fund, including reserve for deferred repairs, stood at £9585, which the Board believed was quite adequate. This figure was £250 more than a year ago. That was to say all that was done had been charged to revenue account; and they were still putting on one side, as had always been done in recent years, a sum for retort renewals, on a calculated basis. They were advised that this provision of £9585 was adequate to cover anything that might be necessary, even taking an extreme view. There were other reserves which were not disclosed in the balance-sheet, and which had not been drawn upon, except to the extent of £250 specially provided at an earlier period for meter renewals. When the results for the half-year to June had been received, the Directors addressed a circular to the shareholders stating that these results were so unsatisfactory that they did not propose to pay an interim dividend. At the same time it was decided to raise the price of gas at Port Elizabeth, where they had been selling it at too cheap a rate. The addition made was equivalent to a net increase of 1s. 2d. per 1000 c.ft. The result of this had been that the profits for the second half-year were better by nearly £2500 than those for the first half. The shareholders might like to know something as to under what heads the difference in the profits by comparison with 1924 might be allocated. On the whole year the receipts for gas were up £1300, due to the increased price of gas in the second half-year. The growth in consumption was negligible; about a level line having been maintained. The consumption in the second half of the year was no doubt checked to a certain extent—though not substantially—by the rise in price. The year was a bad one for coke; and he could not help thinking that the stocks as taken by their then Engineer at the end of 1924 were somewhat over-stated. At all events, this had found its level, and the coke had been properly measured by now; but to some extent it had affected the results for 1925. Tar they had not done quite so well with; but fittings profits were more than maintained. Coal at Port Elizabeth had cost about £1700 more, because Mr. Cleasby had negotiated for a different kind of coal from that formerly used. He anticipated better results from this coal, and the price of it was 2s. 11d. per ton more than for the other; but the better results had not been forthcoming. Therefore this year they had reverted to the cheaper kind of coal, and looked forward to saving the difference in price. Wages were up £200, works repairs £167, and salaries £600 (owing partly to the inclusion of an unusual amount in respect of passage money). At Grahamstown the results, of course, were much worse, by reason of the drop in the sale of gas; but he thought the officials there had done remarkably well in as far as possible reducing expenses to meet the diminished output. Wages were down £230, repairs to works £200, repairs to mains £150, and so on. The total number of consumers at Port Elizabeth was less; but a good deal was being done in the way of installing stoves and geysers. At Grahamstown the curious situation had arisen that they had only actually lost 22 consumers, and fittings and stoves profits were a little more. No doubt people retained gas as a sort of stand-by, but only used it to a very limited extent. As the report told them, the Directors did not recommend the payment of any dividend, though it would have been possible to do so by dipping into the reserves. As it was, they were carrying forward £843 more than had been brought into account. The matter that really concerned them was the cash position. They had a bank overdraft of £4740; but against this there was cash in hand £1374 and investments £6786. These investments were all first class, and at Dec. 31 were worth £7500. These two assets together gave them a margin over immediate liability. They knew that they would have to spend a very considerable amount; and except to the extent he had pointed out the money was not available. Having regard to all the facts, the Board had circularized the shareholders with reference to the issue of a further £5000 of debentures. They did not want to dissipate the whole of their investments. To pay a dividend at the present juncture would not be sound finance. The stronger course was to carry the balance forward, and hope for better things in the current year.

AS TO THE FUTURE.

As regarded the future of Port Elizabeth, there had been a very interesting report issued in relation to developments which contemplated the expenditure of a lot of money on extending the harbour. There were new factories being erected, existing ones were being enlarged, and flats were being built in which gas was being installed for domestic purposes. As far as Grahamstown was concerned, they learned that business was remarkably quiet, and there was very little money in the town. The electricity undertaking had been worked at a loss; and they had now increased their tariff. The town was faced with a possible heavy expenditure in respect to water supply; and on the whole he did not think the outlook at Grahamstown was very encouraging. On the other hand, the developments to which he had referred at Port Elizabeth would undoubtedly help them. He thought that 1926 would prove better in every way than 1925, if for no other reason than that the receipts for gas were bound to be higher because of the addition to the price. The Directors were not in the least discouraged by the outlook. They believed that they had a good property. They commended to the shareholders these further 8 p.ct. debentures, which would form part of the existing issue; but if the proprietors did not take them up, the Directors and their friends would find the money.

Sir CHARLES J. JESSEL, Bart., formally seconded the motion.

Mr. F. R. SMITH said they must all feel that the report was a very disappointing one, though he did not complain of the non-payment of a dividend, because this was the only sound course to adopt. They had a very fine district at Port Elizabeth; and he urged that the works there should be put into a state of thorough repair. Every effort should be made, too, to ascertain the cause of the heavy leakage. He believed the mains at Grahamstown had been laid under the personal supervision of Mr. Henry Woodall, and the job was properly done. There must have been some very different work put in at Port Elizabeth. If these matters were taken in hand, the Association might well be restored to a thoroughly satisfactory position.

Dr. E. C. CARTER also agreed with the decision not to pay a dividend in the circumstances. As to the proposed debenture issue, he thought 8 p.ct. was a great deal to pay for borrowed money. Why not utilize the investments?

The CHAIRMAN pointed out that to-day they owed their bankers close upon £6000; and they proposed to utilize the money provided by the new debenture issue in discharging the overdraft, thus leaving the investments still available as security if they should want to

raise money in the cheapest market—that was, through the bankers—in the future. Having regard to all the circumstances, the proposed course was the best one to adopt. There was no doubt that the works at Port Elizabeth were in a very bad state of repair; but Mr. Scott and Mr. Potter were both of opinion that in the reserve of £9585 there was adequate provision for putting them into a fit condition to do all that was required of them. The outlook for business at Port Elizabeth was very good. It was true that Mr. Henry Woodall thirty years ago laid the mains at Grahamstown; and the leakage there was very different from what it was at Port Elizabeth. It was still under 10 p.ct. at Grahamstown, as compared with over 20 p.ct. at Port Elizabeth.

Mr. A. E. HAYES agreed that the Association had a splendid field at Port Elizabeth. As to Grahamstown, a drop of 43 p.ct. in consumption seemed an extraordinary result of the electrical competition.

The CHAIRMAN remarked that the proportion of lighting at Grahamstown was very high; and the whole of the public lighting had gone.

The report and accounts were then adopted, Sir Charles Jessel was re-elected a Director, and Mr. Percival D. Griffiths was reappointed Auditor.

Hearty votes of thanks were passed to the Chairman and Directors and the officers for their services during 1925. The CHAIRMAN, referring to the work of the staff, said Mr. E. M. Sterley (the local Secretary) had passed through a very anxious time; and their thanks were specially due to him. They also appreciated what Mr. H. Hart had done at Grahamstown.

GRAYS AND TILBURY GAS ORDER INQUIRY.

The application by the Grays and Tilbury Gas Company for a Special Order under section 10 of the Gas Regulation Act, 1920, formed the subject of an inquiry, which was held at the Company's Offices in London Road, Grays, on Monday, June 7, by Mr. JAMES F. RONCA (Director of Gas Administration at the Board of Trade).

In addition to some general clauses, the Company seek under the Order power to construct and maintain gas-works upon additional scheduled land; one part of this land (about 18·54 acres in area) being in the urban district of Grays Thurrock, and the other portion (some 10·289 acres in extent) in the parish of Rayleigh. Authority is also asked to purchase and work-up residual products, and to sell lands which came into their possession under previous Acts and Orders, but which are not for the time being required for the purposes of the undertaking. It was, however, solely with regard to the proposed use for gas purposes of additional land adjacent to the Grays Gas-Works that opposition was encountered at the inquiry.

Mr. A. J. MOON appeared on behalf of the Gas Company; while Mr. H. L. TATHAM conducted the case for the Grays Thurrock Urban District Council. A number of owners and tenants of houses in proximity to the Grays site were legally represented or appeared before the Inspector in person.

Mr. MOON, in opening, explained that the main object of the Order was to enable the Company to manufacture and store gas on the two sites set out in the schedule. The larger of these, somewhat over 18 acres in extent, was immediately adjoining the existing gas manufacturing site at Grays; while the other, in the parish of Rayleigh, was about 18 miles from the works at Grays. To allay misapprehensions which might be felt by certain objectors, he would at once point out that the Company did not intend to, and indeed could not, dispossess under the powers of this Order any person of any house which he now occupied. As he had already stated, the site at Grays on which they were now asking for authority to manufacture gas was close to the existing works; and those persons who seemed apprehensive that the manufacture of gas might be detrimental to health or to the amenities of the place were already living within almost exactly the same distance of the existing gas-works as they would be if, and when, the Company were making gas on the site that was alongside. The Grays Thurrock Urban District Council, who had put in some objections to the Order, had stated that they would like the site which the Company were proposing to acquire for gas-works purposes left available for the erection of houses, so that evidently the Council did not consider a position in close proximity to the existing works in any possible way detrimental to health. The Council also said the scheme was not required, so far as the district of Grays was concerned.

The Company was established as a non-statutory concern in 1853; and the existing works were built upon land acquired at that time. Thus for about 75 years the manufacture of gas had been continued upon the original site. In 1907 the Company was incorporated by Act of Parliament as a statutory undertaking, and authorized to manufacture gas on the present site. The next step forward was in 1913, when an Act was passed empowering the Company to acquire four small neighbouring gas undertakings, including a private one at Rayleigh. The method of charging for gas by the therm was introduced in 1921. The area of the Company was now 160 square miles, and included the Tilbury Docks. The whole of the Company's manufacturing operations were carried out on the site at Grays. The undertakings acquired by the Company had small gas-works; but it was uneconomical to continue the manufacture of gas by them, and so the gas was made at Grays and transmitted to holders, one of which was at Stanford-le-Hope and another at Rayleigh. During the last ten years the gas consumption had increased at a very rapid rate. The quantity supplied in 1915 was 153,452,000 c.ft.; and by 1925 this had increased to no less than 280,015,000 c.ft.—a growth of something like 80 p.ct. So far as one could tell, there appeared to be every likelihood of a continuation in the immediate future of this increase in demand. The result of this extension of business was that the existing gas-works site, which was fully built upon, had become inadequate; and unless the Company secured some further land, it would be impossible for them to meet prospective demands. The largest proportionate increase in quantity of gas supplied had occurred in the Rayleigh area, which was 18 miles away from Grays, and in close proximity to the growing town of Southend. The quantity supplied there in 1915 was 12,716,000 c.ft.; and by 1925 this had increased to 43,900,000 c.ft.—a growth in this short time of some 250 p.ct. In consequence of this increase in demand, it had ceased to be economical to transmit gas from the Grays Works to the Rayleigh area; and this was the reason why the Company asked for power to manufacture gas on this site in the neighbourhood of Rayleigh. While the greatest proportionate increase in the demand for gas had occurred in the Rayleigh area, the greatest actual increase had been in the district round Grays and Tilbury; and in order to cope with this, apart from the Rayleigh area, it would be absolutely necessary to acquire further land on which to manufacture gas. Faced with this question, the Company had for some time past been considering the means. It was extremely important from the point of view of the consumers that fresh land should be secured, and that it should be an economical site. In 1922 the Company obtained powers to manufacture gas on what was known as the Manor Road site, about a mile away from the present works. It was unsuitable for the purpose; but at that time no other site appeared to be available.

Previous to the date mentioned, the Directors and their advisers had been anxious to secure the site which was the subject of the present Order; but the South Essex Water-Works Company had certain rights over their land, in order to protect some of their wells. He was glad to say, however, that recently proposals had been made to the Water Company by which they were quite satisfied that any danger of pollution of their wells could be prevented. An agreement had been entered into between the Gas Company and the Water Company, by which the former agreed to do certain things; and this agreement had been put into the form of a clause which he asked should be inserted in the Order.

PROVISION FOR THE PROTECTION OF THE SOUTH ESSEX WATER COMPANY.

(1) All gasholder tanks and tar and liquor tanks erected by the Company on the land in the Parish of Grays Thurrock described in the schedule to this Order shall be made of steel or other material approved by the Water Company; and all drains in the said land shall be, as far as practicable, made water-tight at the coke yard—or, in other words, shall be so constructed by the Company that the surface water shall pass into the drains, and not percolate into the ground.

(2) The Gas Company will permit the Water Company's Engineer, at all reasonable hours of the daytime, to enter on the said land and inspect such tanks for the purpose of ascertaining if they are remaining water-tight.

(3) In the event of any pollution arising reasonably attributed to the operations of the Company on the said land, the Company shall, after receipt of notice thereof in writing from the Water Company, at once take all reasonable steps to ascertain the cause of such pollution, and shall remedy it, if it is found that such pollution is attributable to the operations of the Company.

Any difference that may arise shall be settled by arbitration.

The result of this agreement, said Mr. Moon, had been to enable the Gas Company to utilize this most advantageous site for the enlargement of their works; and last April an option to purchase it was secured, subject to the granting of the Order. The purchase was to be subject to all existing tenancies; and a right of way through the site was preserved to the owners and lessees. Generally speaking, the area around was now used for various manufacturing purposes. Trees would be planted to blot out the view of the gas-works from the houses. There were a great many persons who had not objected, though they had houses in even closer proximity to the works than those who were appearing at the inquiry. No doubt they realized that it was good for the community at large that there should be this extension of the gas-works, which provided one of the necessities of modern life.

Mr. RONCA: Have you sidings running into the works?

Mr. *A. W. Sumner* (Engineer and Manager): Yes, under agreement with the Quarry Company.

Mr. MOON (continuing) said some of the land at Grays would be immediately available for gas-works purposes, while the other portions would become so at a later date. As to the site selected at Rayleigh, it was the only convenient one. It was entirely unbuilt upon, and would be quite suitable for the erection of gas-works. Three occupiers of bungalows had sent in objections, but were not represented at the inquiry.

Mr. *Sumner*, in evidence, stated that he had been Engineer and Manager of the Company for the past sixteen years. If the demand for gas continued to increase in the neighbourhood of Grays, it would be absolutely essential to add to the manufacturing capacity. He had always regarded the proposed site there as the most suitable for the purposes of the Company, because it meant that they could extend their works rather than build completely new ones. It was a sliding-scale Company, so that all parties were materially interested in keeping-down capital costs. At the moment Rayleigh was furnished with gas from Grays; but if it was to be supplied economically in the future, the gas would, owing to the great increase in demand, have to be manufactured locally. With the expensive roads concerned, the provision of a high-pressure supply, over a distance of 18 miles, would not be economical.

Cross-examined by Mr. TATHAM, witness said nothing had yet been decided as to how the land it was proposed to acquire would be laid

out, though, of course, the matter had been generally considered. He could not therefore give any information on this point.

Mr. *A. A. Johnston* (who was Engineer and Manager of the late Brentford Gas Company) said he had been over the district, and was acquainted with the position of the Company. He was altogether in favour of the proposals. The present works were congested, and there was no room for expansion. The producing plant was working dangerously near its maximum. It was obvious that the site scheduled was, from the point of view of economy, the only one upon which the necessary extensions should take place. As to future demands for gas, the district served by the Company possessed great possibilities. The suggestion to erect works at Rayleigh was the more economic method of solving the problem presented by the rapidly increasing consumption of gas in that part of the Company's area. He was born on a gas-works, and had practically lived on one for a great many years; and he thought it was a healthy situation. Brentford, in spite of congestion, and having a big gas-works right in its heart, was one of the healthiest towns in the kingdom. There were houses there "cheek by jowl" with the works.

Mr. MOON: Does it affect the value of houses?

Witness: It does affect the value of houses, and to the advantage of the owners as a general rule. The very fact that people are employed on a gas-works does away with any difficulty there might otherwise be in finding tenants. Houses near gas-works are seldom empty.

Mr. TATHAM (in cross-examination): Is this such an economical proposition from the Gas Company's point of view that the consumers will have the assurance that the price of gas will come down?

Witness: I do not think anyone living can predict what the future price of gas will be; but it is certainly the most economical course the Company can take in the circumstances, and it is the cost of production that fixes the selling price of gas.

Answering further questions, Mr. Johnston said his experience was that one got a doubling of the consumption in areas like this every ten or twelve years.

Lieut.-Col. *Franklin E. Bartlett* stated that he had been Chairman of the Company since 1902. He considered it necessary to acquire the land proposed, if statutory obligations were to be fulfilled in the future.

Mr. TATHAM (cross-examining): And you cannot say anything definite about what will be done with the land when you get it—how you are going to lay it out?

Witness: That is so. You have to take what the Engineer says. We will do the best we can for the amenities of the place.

Mr. TATHAM: That being so, we still object to the site.

Mr. MOON intimated that this closed the case for the Company; and there was then an adjournment for lunch. On re-assembling, Mr. Moon announced that in the interval the Chairman and representatives of the Company had seen the Chairman and legal representative of the Grays District Council; and they had come to an agreement with regard to the use of the site which was satisfactory to both sides, and which was as follows:

> The Company agree that they will erect no building of any sort or kind in front of the present building-line on the London Road, and that they will erect no building for manufacturing purposes within 20 ft. of the present boundary on the north side of the London Road.

Under these conditions, the Council were willing to withdraw their objections to the Order; and he trusted the settlement would meet with the approval of the Board of Trade.

Mr. TATHAM said he hoped it would be understood that there had been no intention on the part of the Council to obstruct the Company in any way; but they felt it was their duty to defend, as far as they could, the amenities of the district.

This concluded the hearing, and Mr. Ronca subsequently inspected the Grays and Rayleigh sites.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

SPECIAL ORDERS.

Torquay and Paignton Gas Company.

To authorize the transfer to the Company of the St. Mary Church gas undertaking of the Corporation of Torquay, to empower the Company to raise additional capital, &c.

Redditch Gas Company.

To authorize the Company to acquire additional scheduled land, to raise additional capital, further to define and continue the standard rate of dividend and sliding-scale, to relieve the Company of the obligation to keep a shareholders' address book, to establish a profit-sharing scheme, and for other purposes.

ASSOCIATION OF CONSULTING ENGINEERS.

The Twelfth Annual Meeting of the Association—the membership of which now stands at 110—was held at St. Stephen's Club, Westminster, S.W. 1, on Thursday, May 27, when Mr. E. W. Monkhouse, M.A., M.Inst.C.E., presided.

The CHAIRMAN, in moving the adoption of the report and accounts for the year ended April 30, said that the Committee were pleased to record that to an ever-increasing extent the Association was being called on to deal with questions affecting the professional status of consulting engineers, and that a number of important matters of this kind had been dealt with during the past twelve months. This showed that the Association had assumed an important position in engineering circles.

Mr. TOOKEY remarked that there had been a proposition to be considered by the Society of Technical Engineers regarding the registration of engineers. There was mention that the Association should be represented in some way on the Administrative Council. What was the attitude of the Association Committee in this respect?

The CHAIRMAN replied that the matter had been dealt with by the Committee.

The following were elected new members of the Committee: London members—Mr. H. R. J. Burstall, Sir Cyril Kirkpatrick, Mr. J. Mitchell Moncrieff, and Mr. A. H. Preece. Country members—Messrs. H. P. Hill and J. A. Warren.

CONTRACTS OPEN.

Oxide of Iron (New and Spent).

Tenders are invited by the Rochdale Gas Department for the supply of new oxide of iron and the purchase of spent oxide. [See advert. on p. 613.]

Vitriol.

The Gas Department of the County Borough of Rochdale are inviting tenders for the supply and delivery of non-arsenical B.O. vitriol. [See advert. on p. 613.]

Satisfactory Progress at Plymouth.—Submitting the minutes of the Gas Committee at a meeting of the Plymouth Town Council on June 7, Mr. J. Clifford Tozer, the Chairman, stated that they were able once again to report the satisfactory progress of the undertaking during the past twelve months. Notwithstanding that they had reduced the price of gas by 2d. per 1000 c.ft., they were able to show a profit of £4368.

COAL POSITION IN THE MIDLANDS.

From Our Local Correspondent.

While the market is not entirely stagnant, opportunities of business are necessarily very limited. There are no longer any stocks of good-grade coal to be drawn upon. Current output is increasing, however. Several Warwickshire pits are in partial operation. Little sign can be perceived of the union men giving way, though indications are not lacking that many of the miners are wearying of the uncompromising spirit which their leaders evince. There is non-union labour to be had, and at those pits where managements refuse to submit to the embargo the numbers of men employed are slowly—but very slowly—increasing.

On Cannock Chase the prospects of getting back to work on the basis of a temporary agreement for longer working at late wages are not any more hopeful. Some coal has been got in the Rugeley district, not without provoking a violent protest from strikers. Pit mounds of half-a-century's standing are being dug into in the Black Country, there being a market for inferior material in the prevailing impoverishment. Outcrop coal is also being worked to some extent.

The control does not appear to apply uniformly. Part of the fuel now coming on the market is distributed under central direction, and part is dealt in without restriction. The metal-working industries have been greatly assisted in the effort to carry on by reinforcements of fuel which their suppliers have managed to provide. Special accommodation carries special prices. A certain amount of coke is coming in from producing districts, chiefly from Durham.

TRADE NOTES.

High-Pressure Main at West Bromwich.

The West Bromwich Town Council have accepted a tender of Messrs. J. E. Jeavons & Co., Ltd., for the laying of a high-pressure main from the gas-works to Walsall Road, in connection with the supply of gas to the Charlemont Housing Estate.

Extensions at Dunbar.

The Dunbar Corporation have placed the order for the extensions at their gas-works with Messrs. Robert Dempster & Sons, Ltd., of Elland; the extensions consisting of steel-framed retort house and coal store, retort bench, exhauster house, and two purifiers with connectionless valve and yard connections.

"Pyruma" Fire Cement.

Messrs. J. H. Sankey & Son, Ltd., of Canning Town, have published an interesting booklet dealing with their "Pyruma" plastic fire cement. "A chain is only as strong as its weakest link," runs the old adage. It is equally true that firebrick work is only as strong as its weakest joint. Too little attention is given to the jointing (or setting) of firebrick work, and neglect to use a specific standard bond is responsible for a colossal waste of firebricks. There is little or no bonding power in fireclays; and regarding this the costliness of the waste in firebricks, loss of heat, extra renewals and labour, and, above all, lost working hours, has to be reckoned with. These losses, state Messrs. Sankey, can be cut at a single stroke, and the maximum life of the firebrick work secured, by using "Pyruma." The advantages of this material are set out in the booklet, particular emphasis being laid on the facts that, in addition to high refractoriness, it unites with the firebrick work in one solid homogeneous mass, and it expands and contracts to the same degree as the firebrick work. The firm will be pleased to send any of our readers who are interested, and who mention the "JOURNAL," a copy of the booklet, together with a photograph of a practical test carried out with this cement.

CITY AND GUILDS OF LONDON INSTITUTE.

The following questions were set in the City and Guilds of London Institute Examinations in the subjects named (see also *ante* pp. 546-7):

GASFITTING.

FINAL.—PRACTICAL.

1. Make the 20-light meter connection complete ready for fixing, to the instructions given in fig. 1. (1¾ *hours; 30 marks.*)

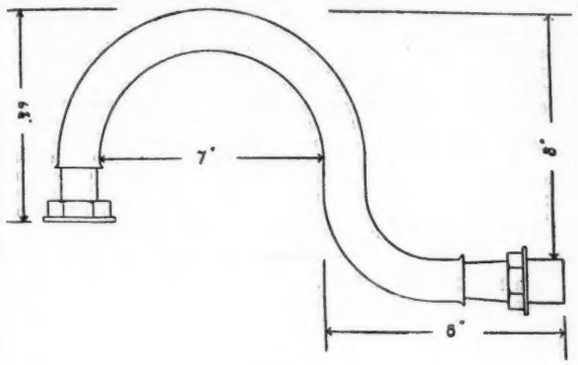

Fig. 1.

2. Bend the ¾-in. steam barrel, and fit up to the dimensions given in fig. 2. (1¾ *hours; 30 marks.*)

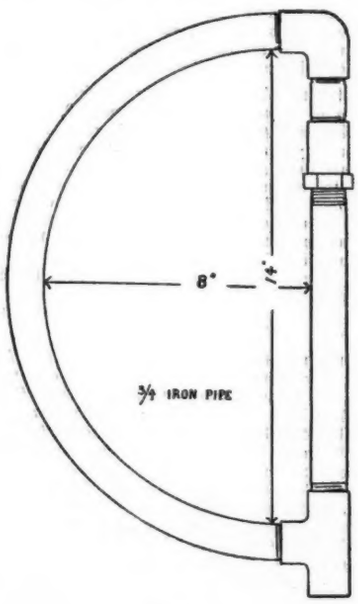

Fig. 2.

3. Make the gas fire connection as shown in fig. 3. Connect and adjust the fire, and leave in working order. State the consumption per hour. (1 *hour; 25 marks.*)

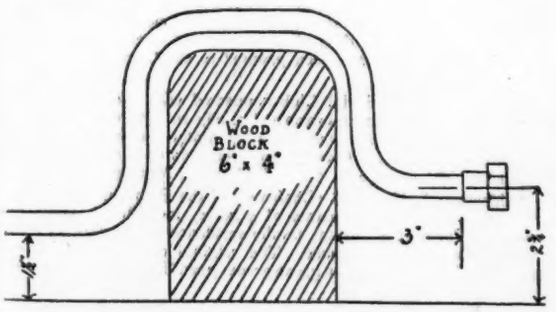

Fig. 3.

4. With the ½-in. compo pipe provided, prepare and make a tee joint. The pipes are to be supported in a fixed position 6 in. above the bench with the branch horizontal while the joint is being blown. (½ *hour; 15 marks.*)

GASFITTING.

GRADE II.—VIVA VOCE.

(The maximum number of marks that may be awarded is given in brackets after each question.)

1. State precisely how you would deal with the following complaint order:

"Bad supply, take pressures and report." (*18.*)

2. Why is a condensation pipe necessary on a "sealed" geyser and not on an "open" geyser? Where should it terminate? Is a condensation pipe necessary on a circulator? Give reasons. (*18.*)

3. What is a compensating meter? Describe the action of the compensating device. What is the function of the float? (*22.*)

4. What is the purpose of the auto-air valve on a gas steam radiator? Describe how it should be adjusted. In what way would an air lock affect the automatic gas valve? (*22.*)

5. Examine the meter provided, and explain the working of the prepayment mechanism. Explain in correct order the four-phase cycle of movements. (*20.*)

GASFITTING.

FINAL GRADE.—VIVA VOCE.

(The maximum number of marks that may be awarded is given in brackets after each question.)

1. What gas circulating boiler or boilers would you instal to meet a demand for 150 gallons of hot water per hour? Give the maximum gas consumption. State size of gas supply required, assuming a 50-ft. run from meter. (*20.*)

2. What size of service and meter would you specify to serve a 20-H.P. gas engine? What is an anti-fluctuator, and how does it operate? (*15.*)

3. What do you understand by the terms "calorific value" and "flame temperature"? What effect has "flame temperature" on the efficiency of (*a*) a gas oven, (*b*) cooker hotplate burners, (*c*) a gas fire, (*d*) an inverted incandescent burner? (*18.*)

4. Explain the construction and working of the geyser and sink boiler; state the approximate consumption per hour of each, and the precautions that should be taken in fixing to ensure safety and efficiency. (*20.*)

5. Explain fully the construction and operation of the two thermostats. If required to increase by 10° Fahr. the temperature at which each operates, how would this be effected? (*12.*)

6. Examine the instrument given to you; explain the principle governing its construction; state fully in what circumstances and how you would use it. (*15.*)

COKE AND BYE-PRODUCTS MANUFACTURE.

FINAL.

(The maximum number of marks obtainable is affixed to each question. Not more than eight questions to be attempted.)

1. Draw, to an approximately correct scale, half-length longitudinal views of a modern type of regenerative coke oven, showing the construction of regenerators and flues. (*40.*)

2. Give a brief illustrated description of the principal types of gas exhausters used in coke oven practice. (*40.*)

3. Write a short essay dealing with one of the following:

(i) Any original work bearing on the carbonizing process,
(ii) The physical properties of coke,
(iii) The sulphur content of coke. (*45.*)

4. Discuss the de-watering of coal. (*45.*)

5. Describe the processes involved in the production of *one* of the following:

(i) Prepared road tar, (ii) commercial chloride of ammonia, (iii) commercially pure naphthalene. (*35.*)

6. What is "Grade I." sulphate of ammonia? Give an account of any method of production with which you are familiar. (*40.*)

7. What precautions would you advise for preventing: (i) Fire, (ii) explosion, (iii) poisoning, on a coking plant? How would you deal with (*a*) benzole fire, (*b*) a case of gas poisoning? (*40.*)

8. Give a detailed account of a method for *one* of the following determinations in coke oven gas:

(i) Condensible hydrocarbons,
(ii) Total sulphur, and sulphur as sulphuretted hydrogen,
(iii) Cyanogen. (*35.*)

9. Write a short account dealing with the use of recording instruments, indicating the particular value of each to the coke oven operator. (*35.*)

10. Illustrating your answer with sketches, discuss the question of grading coke for various purposes. (*35.*)

COAL-TAR DISTILLATION AND CRUDE INTERMEDIATE PRODUCTS.

FINAL.—WRITTEN PAPER.

(The maximum number of marks obtainable is the same for each question. Not more than six questions to be attempted.)

1. Describe, with sketches, a tar distillation plant, for the production of 4000 gallons per day of Ministry of Transport tar No. 1. Give briefly the method of operation.

2. What are the principal differences in composition between a typical horizontal gas retort tar, a vertical gas retort tar, and a coke oven tar? Name the most important qualities of these tars bearing on their use as a raw material for the production of (*a*) road tars; (*b*) pitch for small coal briquetting.

3. Describe a process for the manufacture of *two* of the following

compounds: (*a*) 95 p.ct. anthracene from crude 40's; (*b*) carbazole from crude anthracene; (*c*) orthocresol from a mixture of the isomeric cresols; (*d*) phenol from 60's carbolic acid; (*e*) pure naphthalene from creosote salts.

Give briefly the main chemical reactions of the compounds chosen on which their use in the dye industry depends.

4. Describe, with sketches showing only the essential details, any two forms of modern fractionating column, and state the underlying principles controlling their operation.

5. Give in detail the precautions to be observed when a tar still is to be entered for cleaning. What methods have been suggested for reducing the formation and deposition of free carbon in the still?

6. Write a short essay upon *one* of the following subjects: (*a*) The use of tar on roads; (*b*) sulphate plant effluents; (*c*) recent proposals to increase the production of motor benzole from coal carbonizing processes.

7. Describe the process you would adopt for the manufacture of neutral dry sulphate of ammonia from the acid sale. What are the merits of the product obtained by the process you have chosen?

8. Give a short but careful account of *two* of the following tests, and point out the precautions necessary in order to obtain consistent results: (*a*) The estimation of carbon disulphide in 90's benzole; (*b*) the valuation of 60's carbolic acid; (*c*) the determination of the melting-point and volatile matter content of pitch; (*d*) the determination of the calorific value of a sample of fuel oil.

COAL-TAR DISTILLATION AND CRUDE INTERMEDIATE PRODUCTS.

Final.—Practical Test.

(All the questions may be attempted if time allows, but full marks can be obtained from three satisfactory answers.)

1. What is sample A? Examine it in the usual way, and report on its quality.

2. Examine the sample of heavy naphtha marked B, and state your opinion of its quality.

3. Examine the sample of creosote marked C, to be used in a pressure timber preservation process, and report upon it.

4. Report upon the sample of sulphate marked D.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *June* 14.

There is a fair amount of inquiry for pitch for next season's shipment; but the continuance of the miners' strike is causing a considerable shortage of products, so that makers are having to be very conservative in undertaking forward commitments. The price is nominal at about 80s. per ton f.o.b. makers' works.

Creosote is in short supply, and firm at about 7¼d. per gallon net and naked at makers' works.

Tar spirits are in demand; but the quantities available are limited, and some buyers are finding it difficult to obtain supplies. Pure benzole and pure toluole are firmer at about 2s. 5d. to 2s. 6d. per gallon. Solvent naphtha 05/160 is about 2s. per gallon.

Pyridine is about 10s. to 20s. per gallon.

Tar Products in the Provinces.

June 14.

Markets for tar products have remained steady throughout the week.

Pitch is slightly firmer in price for the prompt position; but buyers are still unwilling to pay the price asked for forward.

For benzole and solvent naphtha there is little more demand, and the price is slightly improved for both articles.

Crude carbolic and cresylic remain unchanged.

The average values for gas-works products during the week were: Gas-works tar, 47s. 9d. to 52s. 9d. Pitch, East Coast, 70s. to 72s. 6d. f.o.b. West Coast—Manchester, 63s. 6d. to 66s.; Liverpool, 65s. to 67s. 6d.; Clyde, 70s. to 73s. Benzole, 90 p.ct. North, 1s. 9d. to 1s. 10d.; crude, 65 p.ct. at 120° C., 1s. 1½d. to 1s. 2¾d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 10d. Toluole, naked, North, 1s. 8d. to 1s. 9d. nominal. Coal-tar crude naphtha, in bulk, North, 8¼d. to 8¾d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 7d. Heavy naphtha, North, 11½d. to 1s. 0¼d. Creosote, in bulk, North, liquid, 6½d. to 6¾d.; salty, 5¾d. to 6d.; Scotland, 5⅝d. to 5¾d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

A Family's Diamond Jubilee.

Dr. Barnardo's Homes celebrate this year their Diamond Jubilee. In the sixty years of work they have received 100,700 destitute boys and girls and babies into their family. It is the largest family in the world, and it continues to grow at the rate of five new admissions every day. At present it numbers 7636 children. To help the food bill of this large family, 400,000 half-crowns are asked for. Bread and butter and milk alone are gigantic items in this account. The recent general strike has severely crippled the funds of this national charity; the need this year is therefore unusually urgent for a generous response to this appeal for food. Cheques and orders payable "Dr. Barnardo's Homes Food Fund," and crossed, and addressed Dr. Barnardo's Homes Food Fund, 18-26, Stepney Causeway, London, E. 1.

Omagh (co. Tyrone) gas profits for the year ended March 31 are reported at £1650, against £1479 for the previous year.

Street Lighting Engineer for Bradford.

A Special Sub-Committee of the Bradford Corporation, appointed some time ago to review the street lighting service, have received a long report from Mr. J. F. Colquhoun, Street Lighting Engineer of Sheffield, and a leading officer of the Institution of Public Lighting Engineers, who was called in as expert consultant, to advise on methods of improvement. The report, which was considered in conjunction with reports by the Gas Engineer (Mr. Charles Wood) and the Electrical Engineer, suggests the lighting of several main tramway routes by electricity. In regard to the gas street lighting, it is urged that it should be converted from the present system of lighting to automatic control. Mr. Colquhoun puts forward that £10,000 per year might be saved by this means in wages alone, and that a further £10,000 per year could be saved by replacing all the upright mantles in the street gas lamps by inverted mantles in modern cluster form, such as exist already in some of the main thoroughfares. At present there are six times as many gas lamps as electric in the Bradford streets. Mr. Colquhoun also recommends—and the idea has been accepted by the temporary Sub-Committee—the appointment of a standing Street Lighting Committee. Against the suggested conversion of gas lighting to automatic control and inverted mantles, the City Treasurer states that the cost in new burners, fittings, and controllers would be £5402. He estimates that the first year of street lighting on the suggestions of Mr. Colquhoun would cost £13,507. The Sub-Committee decided last week to recommend the appointment of a Street Lighting Engineer at a salary of £500 per annum.

British Carbonized Fuels.—This is the title of a private registration, with a capital of £5000, to acquire from Mr. H. P. Bird and Sir Henry Whitehead the benefit of an existing invention for improvements in apparatus for the carbonization of coal, shale, peat, lignite, &c., and to carry on the business of manufacturers of coke, smokeless fuel, and fuel oil.

Gas Cooking at Ascot.—Among other innovations that have been made in the stands at Ascot is the enlargement of the restaurant, which this year seats twice as many people as last year. It was estimated by the caterers that over 5000 meals would be served in the course of the meeting. The new installation in the kitchens includes a Richmond double oven range and a "Bungalow" cooker, both manufactured by the Richmond Gas Stove and Meter Company, Ltd. (Radiation Limited, proprietors).

Meters Limited.—The report of the Directors, to be submitted at the meeting in Manchester to-day (June 16) states that, owing to the severe price-cutting in the gas-meter trade, the working for the year ended March 31 has resulted in a net loss of £7965. The Directors recommend that £15,000 be transferred from the reserve fund and added to the balance of £7488 brought forward from last year, which will give a total of £22,488. After deducting the loss on the year and the interim dividends paid in November last, the amount available for appropriation will be £8437. The Directors recommend the payment of final dividends for the year of 2¾ p.ct. (actual) upon the preference shares and of 3 p.ct. (actual) upon the ordinary shares (making the total dividends for the year 5¾ p.ct. upon the preference shares and 5 p.ct. upon the ordinary shares, both less income-tax), and that the balance of £752 be carried forward.

Harrogate Gas Company's Extension.—The completion of an extension of the Harrogate Gas Company's service to the distant parts of Nidderdale, up to and including the township of Pateley Bridge, was signalized on May 28, when the ceremony of turning on the gas at the Cross Roads, Glasshouses, was performed by Captain C. S. Greenwood, Chairman of the Pateley Bridge Rural District Council, in the presence of the members of the Council and the Board of Directors of the Gas Company, headed by Mr. F. Barber, Chairman of the Company. The new main extends from Birtwith to Pateley Bridge, a distance of 12¾ miles, and is the first extensive outlet to a rural area by this Company. At luncheon, at the King's Arms Hotel, Pateley Bridge, Mr. Barber said that in July the Company would be able to supply gas to the district at 14d. per therm, equivalent to 5s. 4½d. per 1000 c.ft.

The Lytham St. Annes Gas Committee recommend that special terms of 8d. per therm net be granted to consumers of 50,000 c.ft. of gas and over, per quarter, by use of a circulating water heater with a six-hours' demand.

Under the Coal (Emergency) Directions the Liverpool Gas Company were restricted in the supply of gas for power purposes in certain industries; but with a view to averting unemployment in these industries, permission has been granted to the Company to distribute a full supply.

Members of the Social Club connected with the Blackburn Corporation Gas Department organized a trip to Knaresborough on the 12th inst. The journey was made by motor coach, and over sixty participated. On the outward journey chocolates and cigars were distributed by Mr. George P. Mitchell (General Manager).

Alderman J. H. Lloyd (Chairman of the Birmingham Gas Committee) has presented an estate of 9 acres, including a large house, known as Farm—the ancient family residence at Sparkbrook—to the Corporation as an open space. The original purchaser of the estate was the Alderman's great-great-great grandfather, the founder of Lloyds Bank in 1765.

The Bradford City Council have deferred consideration of the recommendation by a Special Sub-Committee (following on a report by Mr. J. F. Colquhoun, Sheffield City Lighting Engineer, on Bradford's street lighting) that they should appoint a Public Lighting Engineer at a salary of £500 a year to take complete control of a co-ordinated gas and electric lighting system. The matter was deferred to give members of the Bradford Corporation more time to digest the long report of the expert.

STOCK MARKET REPORT.

APART from the miniature boom in Tobacco shares brought about by the bonus announcement of the British American Tobacco Company, the success of the new issues was the most prominent feature of the week on the Stock Exchange. The principal of these issues were the New Zealand and Victoria Loans and the San Paulo Coffee issue. The attractive terms thereof led to a realization of assets to provide the necessary funds, and brought about a general weakness in gilt-edged.

The Chairman's statement on the position of Sir W. G. Armstrong, Whitworth, & Co., is very unsatisfactory reading; and it is fairly evident that some considerable time must elapse before the shareholders can hope for a return to anything approaching the pre-war prosperity. In the Miscellaneous Market, Lyons' shares were prominent on the satisfactory dividend announcement.

Further depreciations took place in the Home Railway Market on the apparently hopeless outlook of the coal dispute; and this also continues to depress the Gas Market. It will be seen from the Table that, with the exception of the South Metropolitan ordinary, which rose 1 point, all the changes in the quotations, though slight, were in a downward direction. The marking down of the Commercial Company's two stocks is surprising, as the quotations were previously on the low side.

The report of the Plymouth and Stonehouse Company reveals a satisfactory position with regard to the sales of gas, which are nearly 4 p.ct. in excess of the previous year. The balance of the revenue account, £28,223, compares with £35,205 for the year 1924-25, the reduction being due to the fall in the value of residuals. The dividend declared, £7 17s. 6d. p.ct. per annum, is the same as the previous year.

The following transactions were recorded during the week:

On Monday, Cape Town 7½, European 5, Gas Light and Coke 80½, 80⅝, 81, Imperial Continental 126½, 127½, Primitiva 10s. 1½d., 10s. 3d., 10s. 4½d., 10s. 5¼d., South Metropolitan 92⅜, 93, 93¼, South Suburban 5 p.ct. 90½, Uxbridge 5 p.ct. 90½. Supplementary prices, Romford (10 p.ct.) 10½.

On Tuesday, Bournemouth 6 p.ct. preference 10, Cape Town 7½, Commercial 4 p.ct. 77, 77½, 78, 3½ p.ct. 76, 79½, Gas Light and Coke 80¼, 80½, 81, 3½ p.ct. maximum 58¼, 4 p.ct. preference 76½. Imperial Continental 127¾, Montevideo 75¼. Primitiva 10s. 1½d., 10s. 4½d., 4 p.ct (River plate) debenture 68, South Metropolitan, 92⅜, 93½. Southampton 79¼, 4 p.ct. debenture 70, 70⅜. Uxbridge 5 p.ct. 91½.

On Wednesday, Bombay 19s. 10¼d., British 100⅜, Cape Town 4½ p.ct. preference 6½, 6⅝, Eastbourne 5 p.ct. debenture 95½, Gas Light and Coke 80¼, 80½, 80¾, 80⅞, 81, 4 p.ct. preference 76½, Imperial Continental 126¾, 127½, 128, Oriental 99¼, Primitiva 10s. 1½d., South Metropolitan 92⅜, 93¼, 94. Southampton 78¾.

On Thursday, Bombay 20s. 6d., 21s., Commercial 3½ p.ct. 76, Continental Union 30, 30¼, Croydon sliding-scale 97, European 5½, Gas Light and Coke 80¼, 4 p.ct. preference 77¾, Imperial Continental 126, 128, Oriental 100, Primitiva 10s., 10s. 1½d., South Metropolitan 93, 93¼, 3 p.ct. debenture 58, Uxbridge 5 p.ct. 90, 90½.

On Friday, Bombay 20s. 3d., Gas Light and Coke 80¼, 80⅜, 4 p.ct. preference 77, 78, Primitiva 10s., South Metropolitan 94.

In Lombard Street at the end of the week money was again in plentiful supply; and though there was no record of accommodation being arranged at lower than 3 p.ct., supplies at that rate exceeded the demand. Attempts to harden discount rates on the announcement of the increase in the Treasury Bill rate—viz., £4 6s. 8·33d. p.ct.—were, in consequence of the abundant supplies, unsuccessful.

In the Foreign Exchange Market, while there was little activity, the story was again the weakness of the franc. The French rate at one time reached 168, but dropped back at the close to 165¼. Belgian francs closed at 163⅜, after touching 165½. There was a slight improvement in the Italian exchange, which finally closed at 133½. Spanish pesetas were prominent on support from Paris and New York, the closing rate being 31·07½. Sterling hardened, and the New York rate finished at 4.86 7/16.

Silver was quiet, and the price for bars remained at 30 1/16d. per oz. Gold remained unchanged at 84s. 11½d. per oz., with no supplies available.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. June 11.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
5,171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. C.	74—77	..	..
322,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—74	..	..
1,551,868	,,	Apl. 1	6¼	6½	Alliance & Dublin Ord.	75—80	..	..
374,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	May 6	1/7⅓	1/7⅓	Bombay, Ltd.	15—1 1/16	..	..
170,000	10	Mar. 4	8⅓	8⅓	Bournemouth 5 p.c.	12—13	..	19/10½—21/-
425,050	10	,,	7	7	Do. B 7 p.c.	12—12⅓	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	Jan. 7	3	3	Do. 3 p.c. Deb.	55—58	..	10
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
214,740	,,	Mar. 18	12	12	Brighton & Hove Orig.	167—172	..	..
244,300	,,	,,	9	9	Do. A Ord.	128—133	..	..
1,387,500	,,	Feb. 18	5	5	Bristol 5 p.c. max.	88⅜—89¼a	..	..
855,000	,,	Mar. 18	8	7	British Ord.	98—103	..	..
100,000	,,	Jan. 7	7	7	Do. 7 p.c. Pref.	117—122	..	100⅞
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—74	..	..
100,000	10	June 10	6	8	Cape Town, Ltd.	6—7*	..	..
150,000	10	Apl. 22	4½	4½	Do. 4½ p.c. Pref.	5⅞—6⅞	..	7⅛
636,860	Stk.	Jan. 7	4½	4½	Do. 4½ p.c. Deb.	68—73	..	6⅛—6⅞
237,960	,,	Feb. 18	6	6	Cardiff Con. Ord.	96—99	..	..
157,150	,,	Jan. 7	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
79,185	,,	Mar. 4	5	6½	Chester 5 p.c. Ord.	87½—92½b	..	..
24,495	1	Apl. 22	12/-	1/4½	Colombo Ltd. Ord.	28/—30/-	..	..
1,513,280	Stk.	Mar. 4	1/4½	5½	Do. 7 p.c. Pref.	20/—22/-	..	..
560,000	,,	,,	5⅝	5/3/4	Commercial 4 p.c. Cap.	77—80	..	..
475,000	,,	Dec. 17	5/3/4	5/8/4	Do. 3½ p.c. Cap.	76—79	−1	77—78
800,000	,,	Oct. 8	3	3	Do. 3 p.c. Deb.	55—58	−1	76—79½
200,000	,,	Mar. 4	—	4	Continental Union, Ltd.	30—35	..	..
737,150	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	−2	30—30¼
403,100	,,	,,	6½	6½	Croydon sliding scale	95—98	..	..
492,270	,,	,,	5	5	Do. max. div.	79—82	..	97
55,000	,,	Mar. 4	6	9	Derby Con.	107—109c	..	..
209,000	,,	Dec. 17	4	4	Do. Deb.	74—76c	..	..
50,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
1,002,180	,,	Dec. 17	—	5	Eastbourne 5 p.c. Deb.	93—98	..	..
18,788,960	10	Apl. 1	†6	†4	European, Ltd.	5—6	..	..
2,600,000	Stk.	Feb. 18	5⅛	4/17/4	Gas Light & Coke 4 p.c. Ord.	80—82	..	95⅛
4,157,020	,,	,,	3½	3⅜	Do. 4 p.c. max.	58—61	..	5—5⅛
5,602,620	,,	,,	4	4	Do. 4 p.c. Con. Pref.	75—78	..	80¼—81
181,315	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	57—60	..	58⅛
130,000	,,	—	—	—	Do. 6 p.c. Br'tf'd Rd. Db.	102—104	..	76½—78
42,000	,,	—	10	10	Do. 10 p.c. Bonds.	..	..	..
82,500	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
258,740	,,	Mar. 18	6⅔	6⅔	Hastings & St L. 5 p.c. Conv	88—93	..	..
70,000	,,	,,	5⅓	5⅓	Do. 3½ p.c. Conv.	68—73	..	..
173,200	10	June 10	†10	†10	Hongkong & China, Ltd.	19½—20¾*	−½	..
1,976,000	Stk.	Mar. 4	10	10	Hornsey Con. 3½ p.c.	66—68	..	..
226,170	,,	May 20	10	†10	Imperial Continental Cap.	125—130	..	..
235,242	,,	Feb. 4	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	126—128
2,127,340	,,	Mar. 18	6⅔	6⅔	Liverpool 5 p.c. Ord.	95—100	..	..
600,000	,,	Feb. 18	5⅓	6⅔	Lea Bridge 5 p.c. Ord.	79—80b	..	..
165,736	,,	Mar. 18	7	5⅓	Do. 7 p.c. Red. Pref.	101¼—103½b	..	..
63,480	,,	Feb. 18	9	7	Maidstone 5 p.c. Cap.	115—120	..	..
75,000	,,	Dec. 17	3	8	Do. 3 p.c. Deb.	54—59	..	..
541,920	5	Dec. 3	†7	3	Malta & Mediterranean	4⅛—5	..	..
2,061,315	Stk.	May 20	†4	†6	Montevideo, Ltd.	74—77	..	..
360,929	,,	Mar. 4	5	†6	Newcastle & Gateshead Con.	70¼—71¼d	..	75¼
529,705	,,	,,	4	5	Do. 4 p.c. Pref.	75—76d	..	..
15,000	,,	Dec. 17	3½	4	Do. 3½ p.c. Deb.	69—71d	..	..
91,530	,,	Mar. 4	11¼	3½	North Middlesex 10 p.c.	155—160	..	..
300,000	Stk.	,,	8 5/16	11¼	Do. 7 p.c.	112—117	..	..
188,120	,,	May 6	9	8 5/16	Oriental, Ltd.	95—100	..	..
60,000	,,	Jan. 7	7⅞	7	Plym'th & Ston'house 5 p.c.	110—115	..	99⅛—100
100,000	50	Mar. 4	14	7⅞	Portsea Island B	90—95	..	..
3,289,909	50	,,	13	14	Do. C	88—93	..	..
382,200	1	,,	—	13	Primitiva Ord.	9/9—10/9	−/3	10/0—10/5½
600,000	100	June 1	—	—	Do. 4 p.c. Red. Deb.	83—85*	..	..
180,305	Stk.	Jan. 21	4	4	Do. 4 p.c. Red. Deb. 1911	66—68	..	..
256,847	,,	Dec. 17	4	4	Do. B. Aires 4 p.c. Rd. Db.	66—68	..	..
150,000	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	66—68	..	..
195,000	10	Mar. 18	4	4	San Paulo 6 p.c. Pref.	7⅞—8	..	68
270,000	50	Jan. 4	6	6	Do. 5 p.c. Red. Deb.	43—46	..	..
419,968	Stk.	Mar. 18	5	5	Sheffield A	99—101e	..	..
1,047,000	,,	,,	5½	6	Do. B	99—101e	..	..
90,000	,,	,,	5½	6	Do. C	99—101e	..	..
6,609,895	10	June 11	4	6	South African	5—7	..	..
1,895,445	Stk.	Mar. 4	5	—	South Met. Ord.	92—94	..	..
734,000	,,	Jan. 7	3	7	Do. 3 p.c. Deb.	56—59	+1	92⅜—94
91,500	,,	Mar. 4	6½	3	Do. 6½ p.c. Red. Db.	102—104	..	58
1,187,795	,,	Mar. 4	8½	6½	South Shields Con.	117—119d	..	..
368,897	,,	Mar. 4	6½	8½	South Suburban Ord. 5 p.c.	98—101	..	..
647,740	,,	Dec. 17	5	6½	Do. 5 p.c. Deb.	94—97	..	98¼—99½
121,275	,,	Mar. 18	5	5	South'mpton Ord. 5 p.c.max.	77—80	..	..
250,000	,,	Jan. 7	4	5	Do. 4 p.c. Deb.	69—74	..	78⅜—79½
200,000	,,	Mar. 4	7	4	Swansea 7 p.c. Red. Pref.	99—102	..	70—70⅜
120,000	,,	Dec. 17	6½	7	Do. 6½ p.c. Red. Deb.	100—102	..	..
882,275	,,	Feb. 18	7½	6½	Tottenham District A 5 p.c.	108—113	..	..
150,000	,,	,,	7½	7½	Do. B 3½ p.c.	88—91	..	..
181,255	,,	,,	5⅞	5⅞	Do. 5½ p.c. Pref.	101—103	..	..
258,251	,,	June 10	28/4	5½	Do. 4 p.c. Deb.	73—76*	..	..
	,,	Mar. 18	4	4	Tynemouth Con. and New	67—68d	−1	..
197,294	,,	,,	5	5	Uxbridge, Maidenhead, & Wycombe 5 p.c.	..	..	..
88,330	,,	Mar. 4	6⅝	6⅝	Do. 5 p.c. pref.	90—95	..	..
91,800	,,	,,	5	5	Do. 5 p.c. Maidenh'd	85—90	..	90—91½
	,,	,,	6⅔	6⅔	Wandsworth, Wimbledon, and Epsom—	87—93	..	..
30,000					Wandsworth A 5 p.c.	123—128	..	..
255,636	,,	Mar. 4	8⅓	8⅓	Do. B 3½ p.c.	103—108	..	..
412,450	,,	,,	7	7	Do. C and New	88—93	..	..
352,000	,,	,,	5/19/0	5/19/0	Wimbledon 5 p.c.	97—102	..	..
98,000	,,	,,	6⅔	6⅔	Epsom 5 p.c.	105—110	..	..
86,416	,,	Jan. 7	7⅛	7⅛	3 p.c. Deb.	55—58	..	..
			3	3				

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